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Luo et al.

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(54) **EFFICIENT SYSTEM IDENTIFICATION SCHEMES FOR COMMUNICATION SYSTEMS**

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(51) **Int. Cl.**
H04J 3/06 (2006.01)
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(52) **U.S. Cl.**
CPC ***H04W 48/12*** (2013.01); *H04J 11/0069* (2013.01); *H04L 27/2602* (2013.01)

(58) **Field of Classification Search**
USPC 370/252, 328, 335, 336, 337, 338, 342, 370/343, 344, 347, 350
See application file for complete search history.

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Primary Examiner — Ricky Ngo
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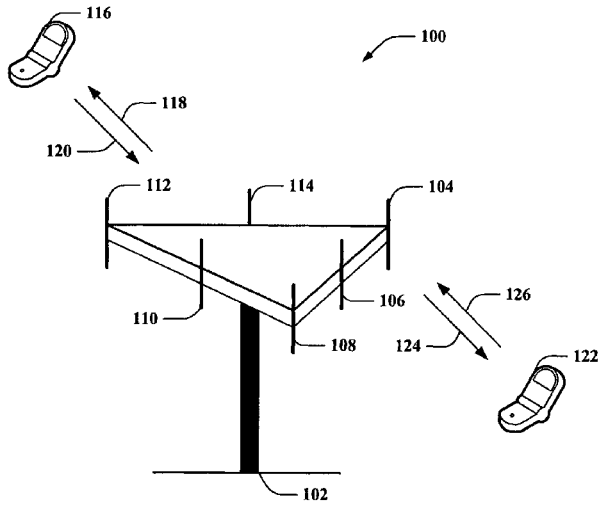
(57) **ABSTRACT**

Systems and methodologies are described that facilitate efficiently indicating parameter(s) associated with a base station utilizing synchronization signals in a wireless communication environment. For instance, relative locations of a PSC and a SSC in a radio frame can be a function of a parameter. Further, a PSC sequence utilized to generate PSCs can be selected based upon a parameter. Moreover, inclusion or exclusion of PSCs from a radio frame can be a function of a parameter. Additionally or alternatively, pseudo random sequence mappings (e.g., to cell IDs, tone locations) can be a function of a parameter. Example parameters can be whether the base station is part of a TDD or a FDD system, whether the radio frame employs FS1 or FS2, whether the base station is associated with a macro or a femto cell, or whether the base station is associated with a unicast or a multicast system.

50 Claims, 14 Drawing Sheets



(51) **Int. Cl.**

H04J 11/00	(2006.01)
H04L 27/26	(2006.01)

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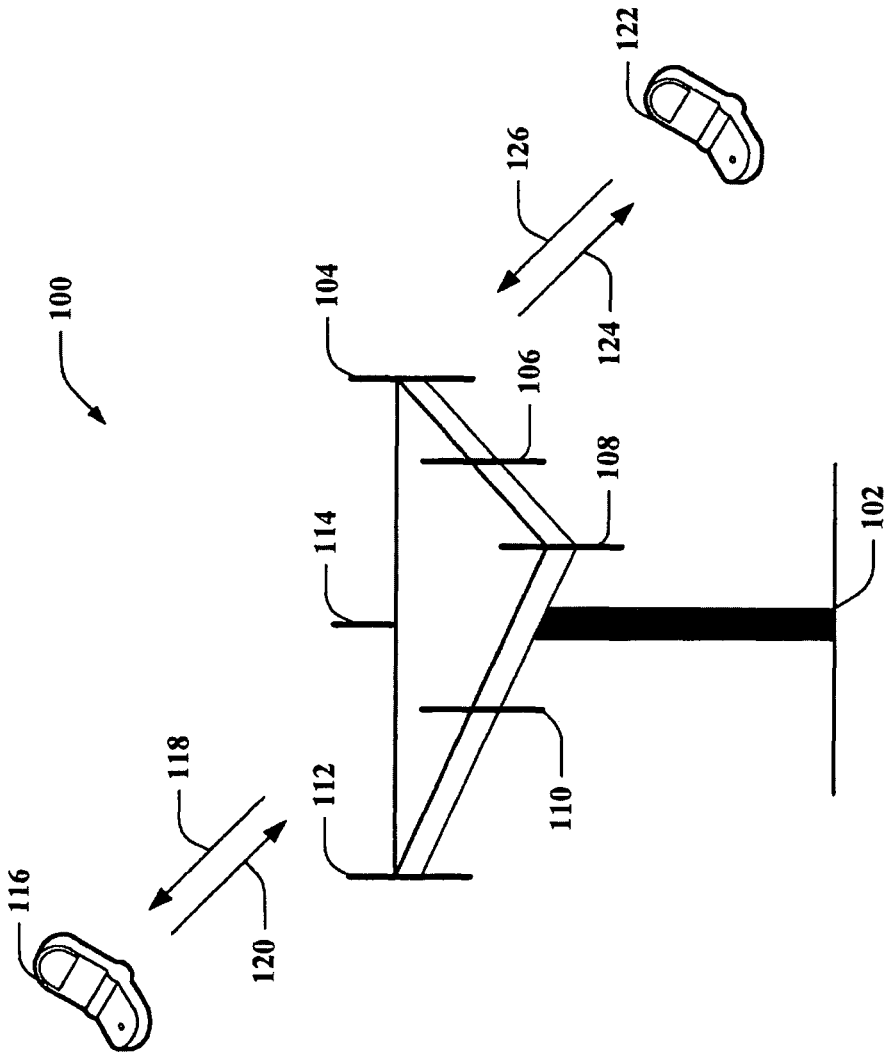

FIG. 1

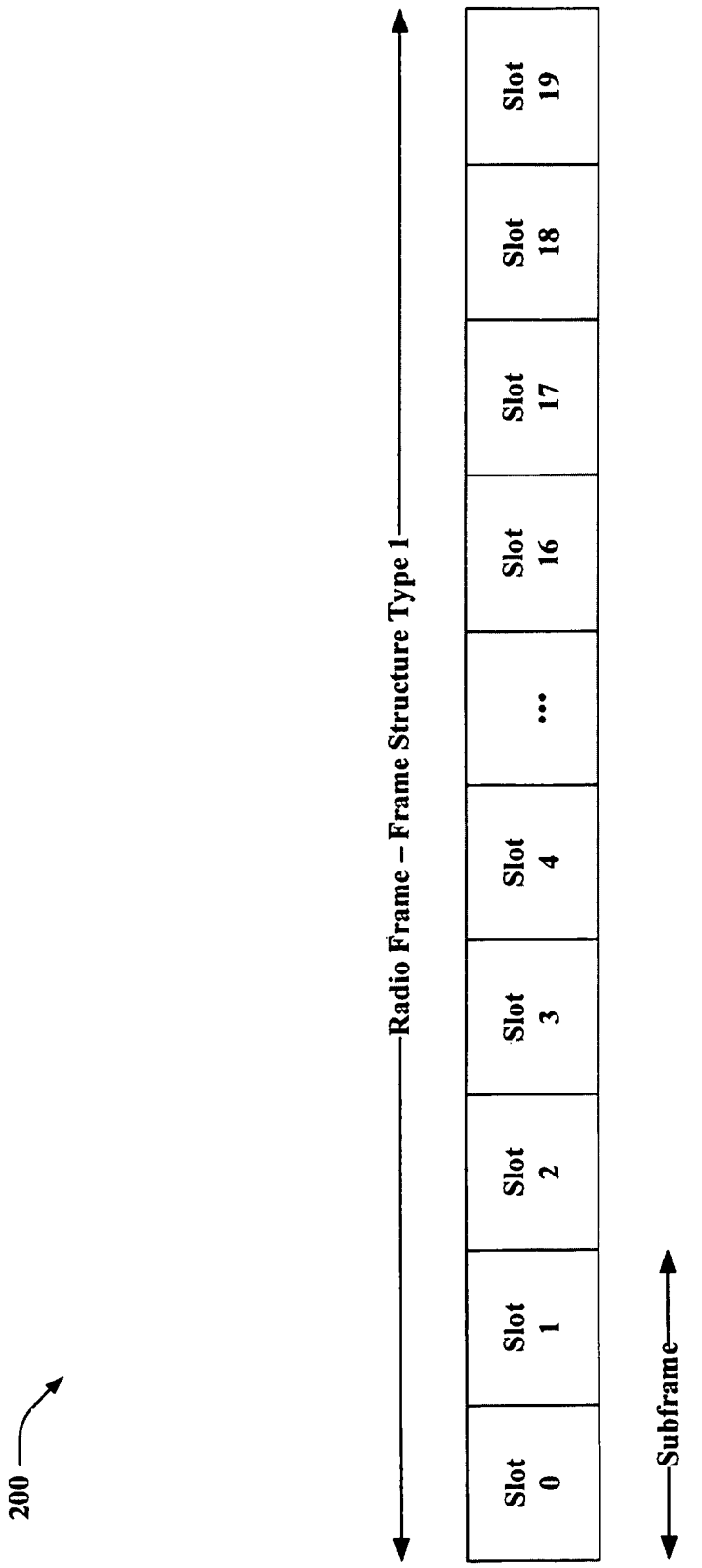
200
Radio Frame – Frame Structure Type 1
Slot 0
Slot 1
Slot 2
Slot 3
Slot 4
...
Slot 16
Slot 17
Slot 18
Slot 19
Subframe

FIG. 2

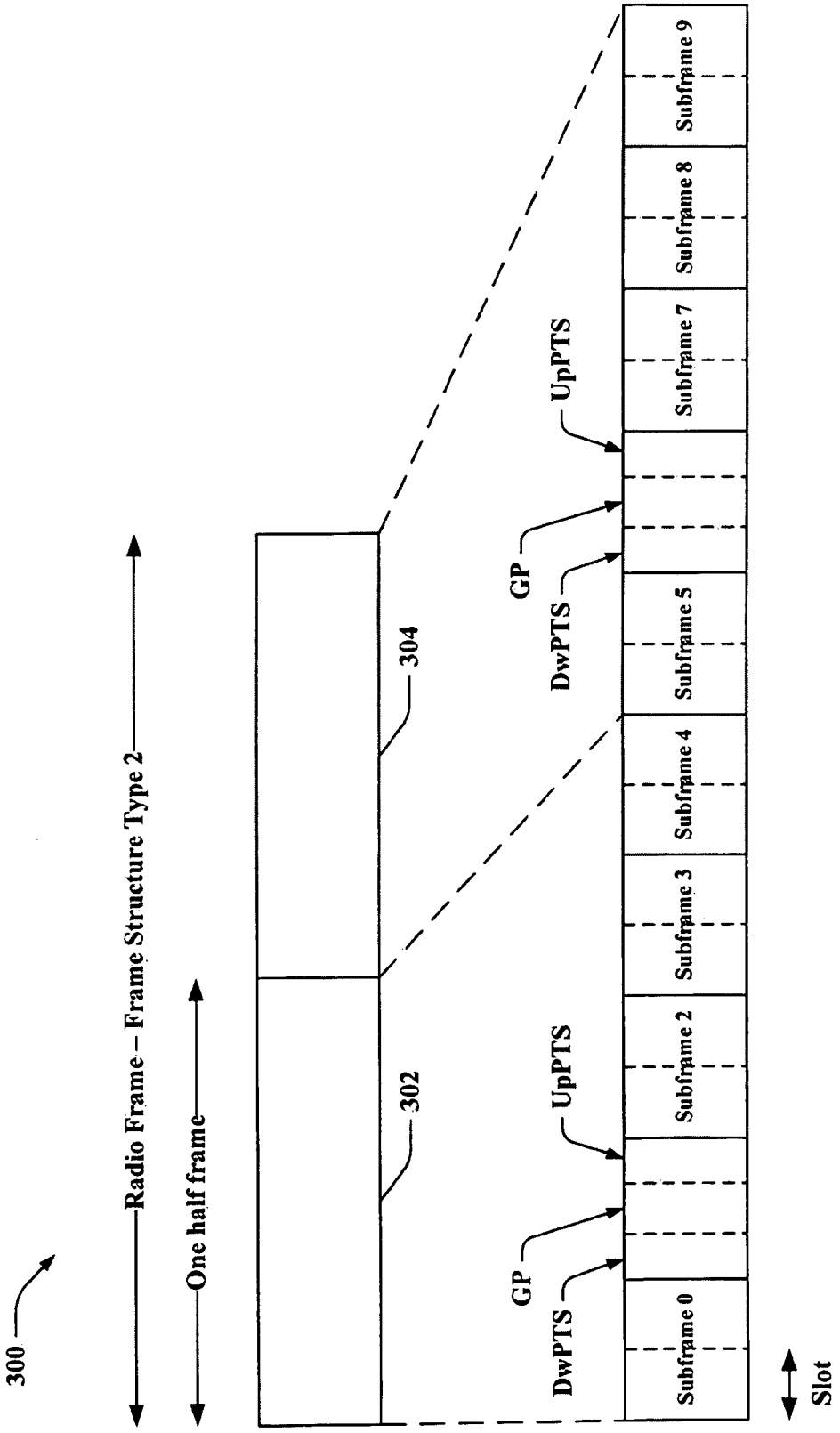
300
Radio Frame – Frame Structure Type 2
One half frame
302
304
Subframe 0
DwPTS
GP
UpPTS
Subframe 2
Subframe 3
Subframe 4
Subframe 5
DwPTS
GP
UpPTS
Subframe 7
Subframe 8
Subframe 9
Slot

FIG. 3

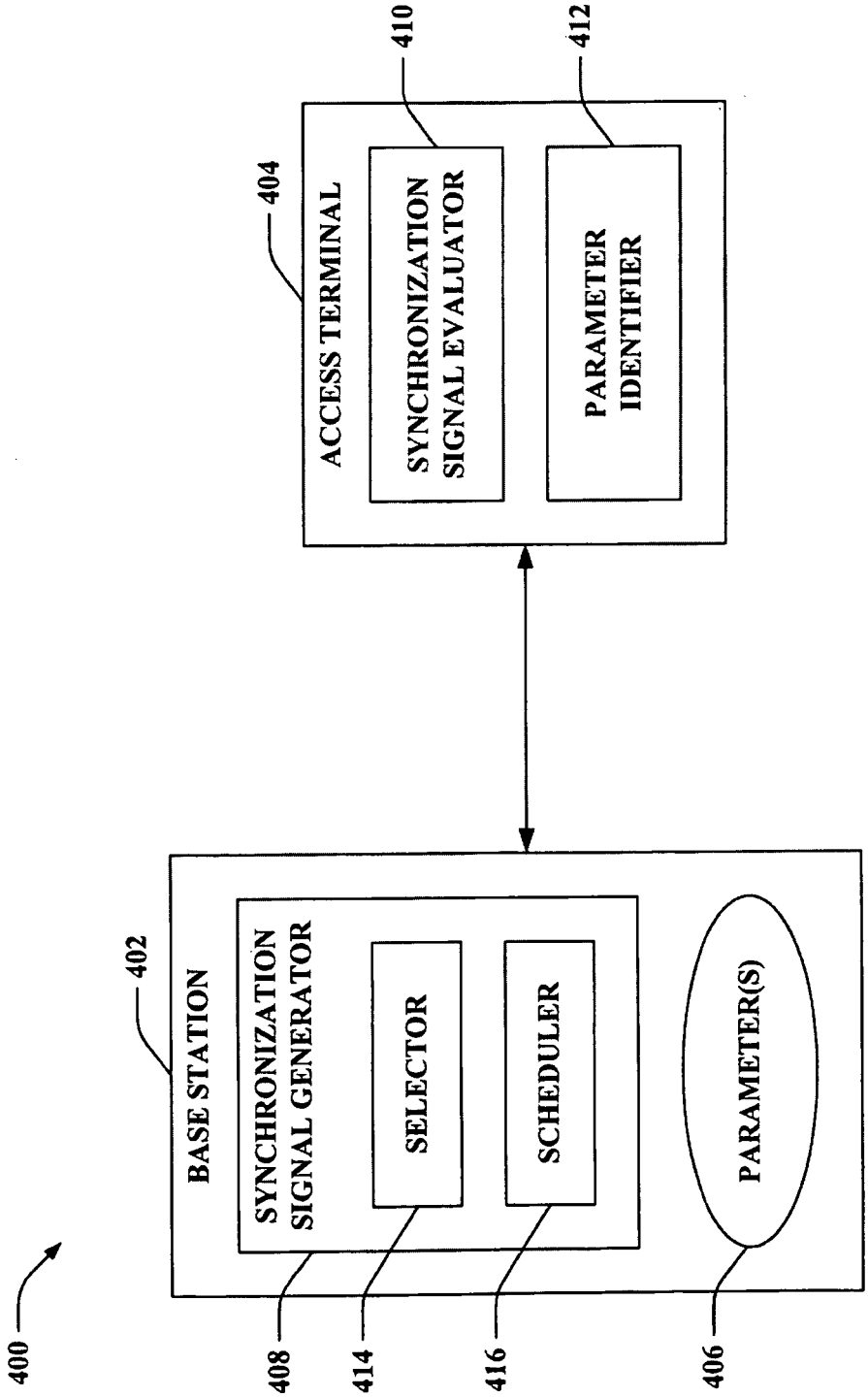
400
402
BASE STATION
SYNCHRONIZATION SIGNAL GENERATOR
SELECTOR
SCHEDULER
PARAMETER(S)
404
ACCESS TERMINAL
SYNCHRONIZATION SIGNAL EVALUATOR
PARAMETER IDENTIFIER
408
414
416
406
410
412

FIG. 4

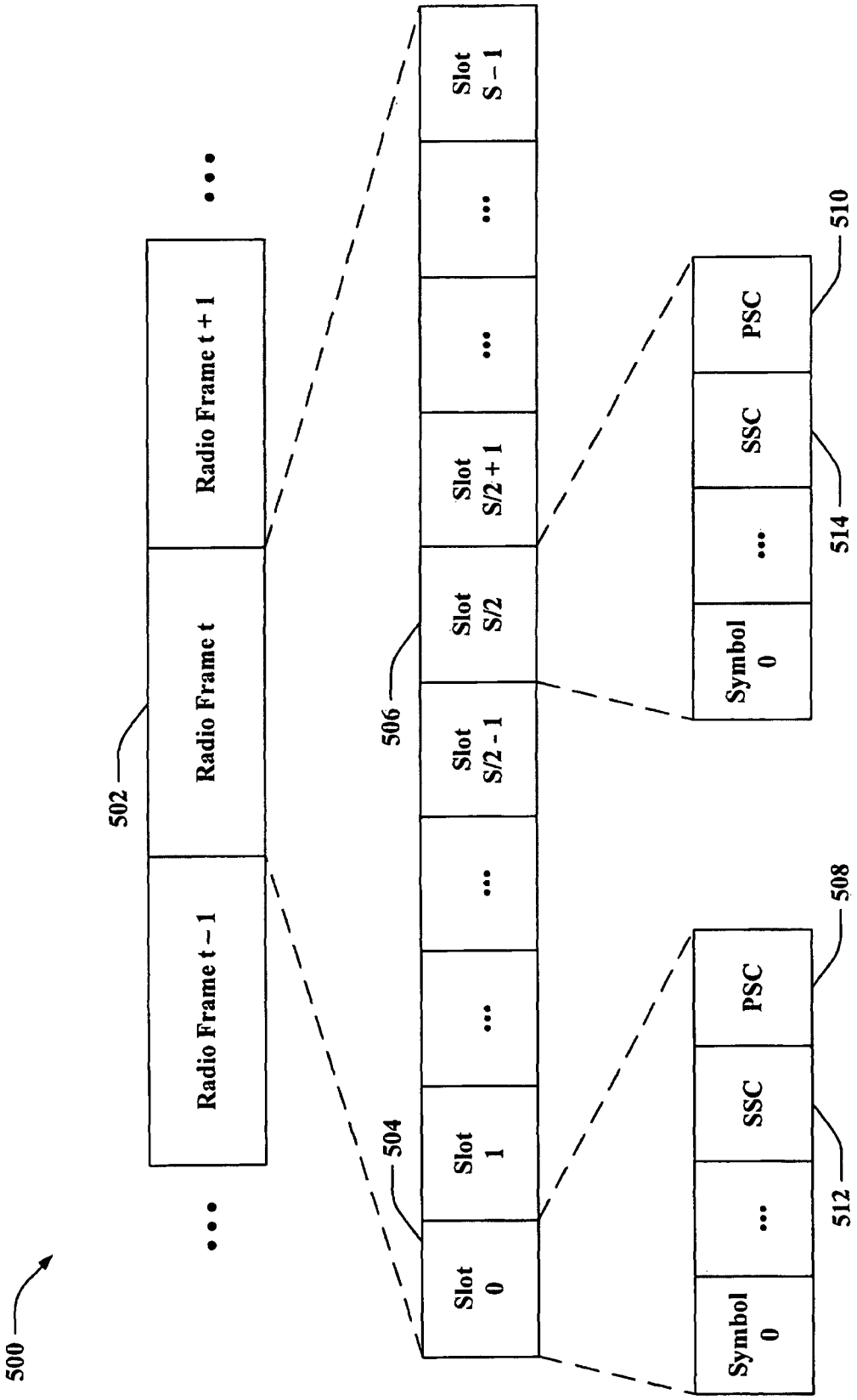
500
502
Radio Frame t - 1
Radio Frame t
Radio Frame t + 1
504
Slot 0
Slot 1
Slot S/2 - 1
506
Slot S/2
Slot S/2 + 1
Slot S - 1
508
Symbol 0
SSC
PSC
512
510
Symbol 0
SSC
PSC
514

FIG. 5

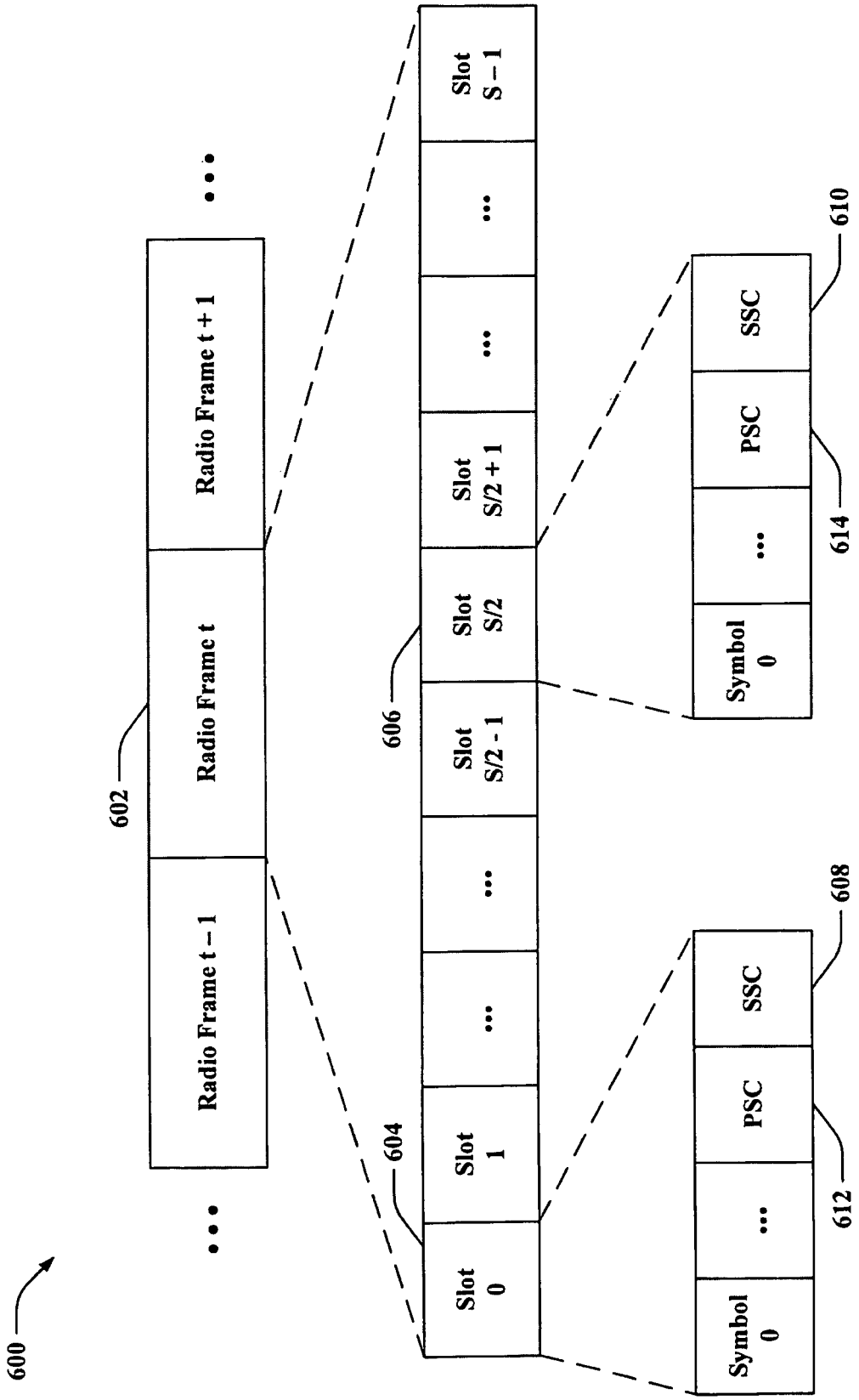
600
602
Radio Frame t - 1
Radio Frame t
Radio Frame t + 1
604
Slot 0
Slot 1
Slot S/2 - 1
606
Slot S/2
Slot S/2 + 1
Slot S - 1
608
SSC
PSC
Symbol 0
610
SSC
PSC
Symbol 0
612
614

FIG. 6

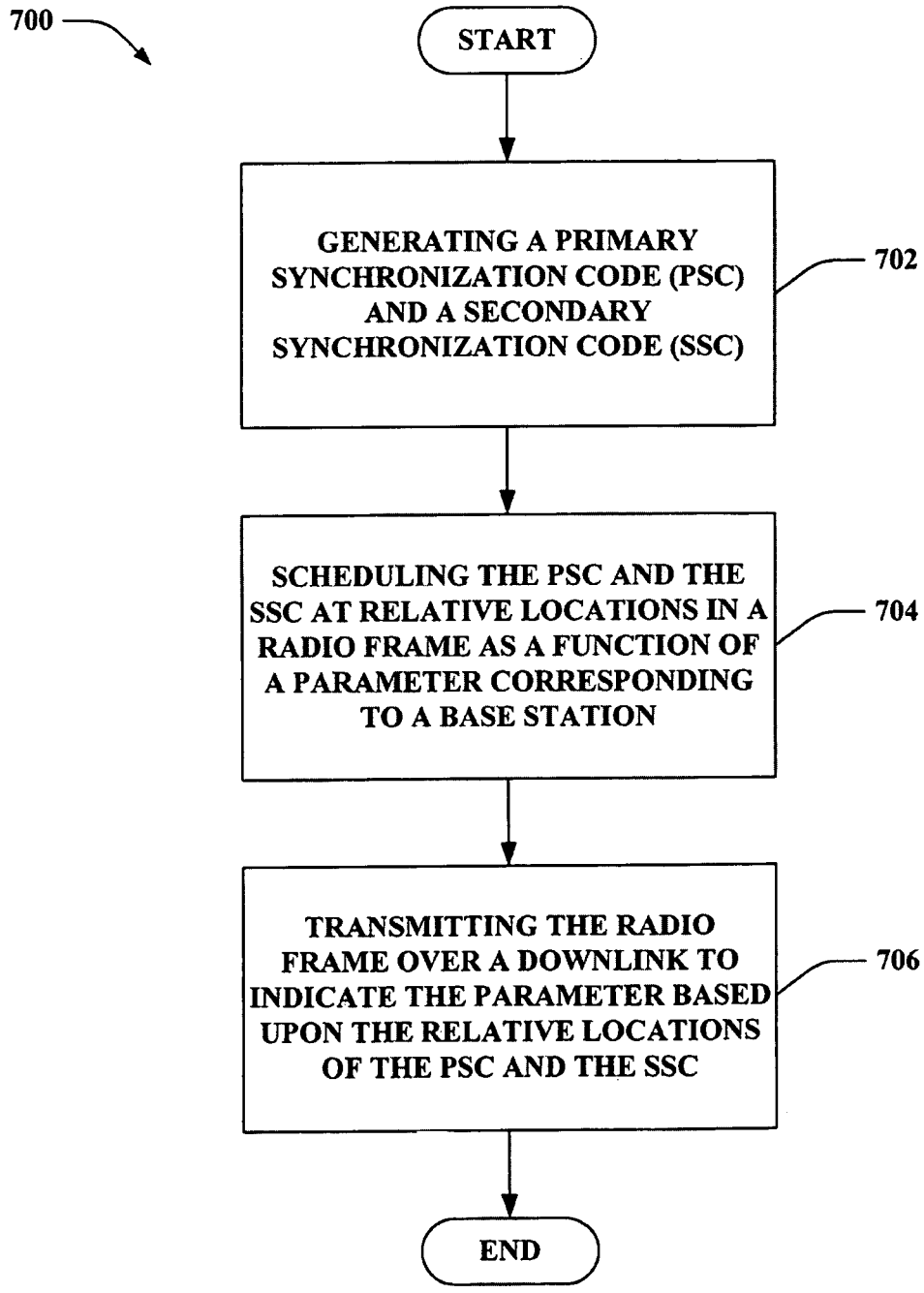
700
START
GENERATING A PRIMARY SYNCHRONIZATION CODE (PSC) AND A SECONDARY SYNCHRONIZATION CODE (SSC)
702
SCHEDULING THE PSC AND THE SSC AT RELATIVE LOCATIONS IN A RADIO FRAME AS A FUNCTION OF A PARAMETER CORRESPONDING TO A BASE STATION
704
TRANSMITTING THE RADIO FRAME OVER A DOWNLINK TO INDICATE THE PARAMETER BASED UPON THE RELATIVE LOCATIONS OF THE PSC AND THE SSC
706
END

FIG. 7

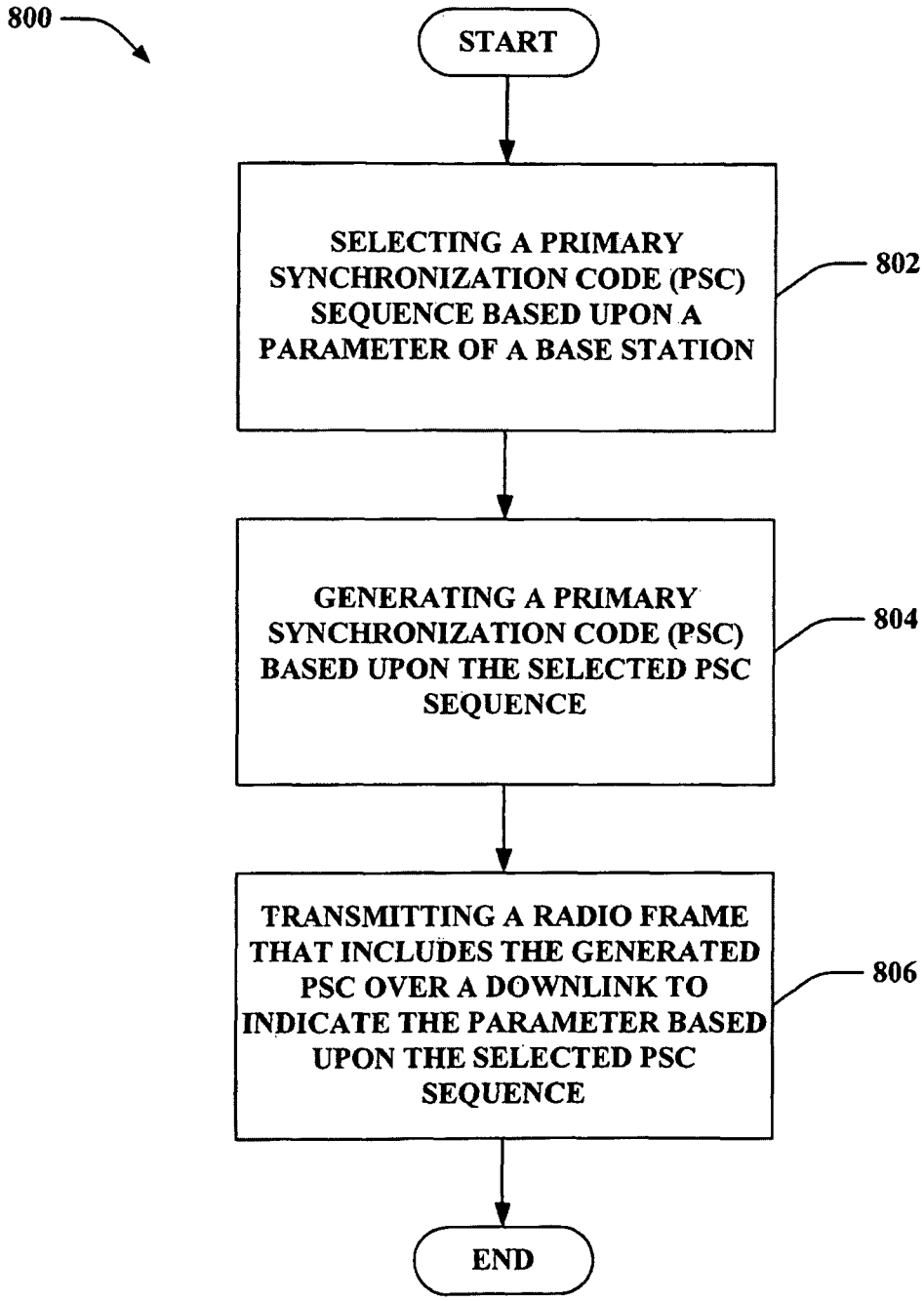
800
START
SELECTING A PRIMARY SYNCHRONIZATION CODE (PSC) SEQUENCE BASED UPON A PARAMETER OF A BASE STATION
802
GENERATING A PRIMARY SYNCHRONIZATION CODE (PSC) BASED UPON THE SELECTED PSC SEQUENCE
804
TRANSMITTING A RADIO FRAME THAT INCLUDES THE GENERATED PSC OVER A DOWNLINK TO INDICATE THE PARAMETER BASED UPON THE SELECTED PSC SEQUENCE
806
END

FIG. 8

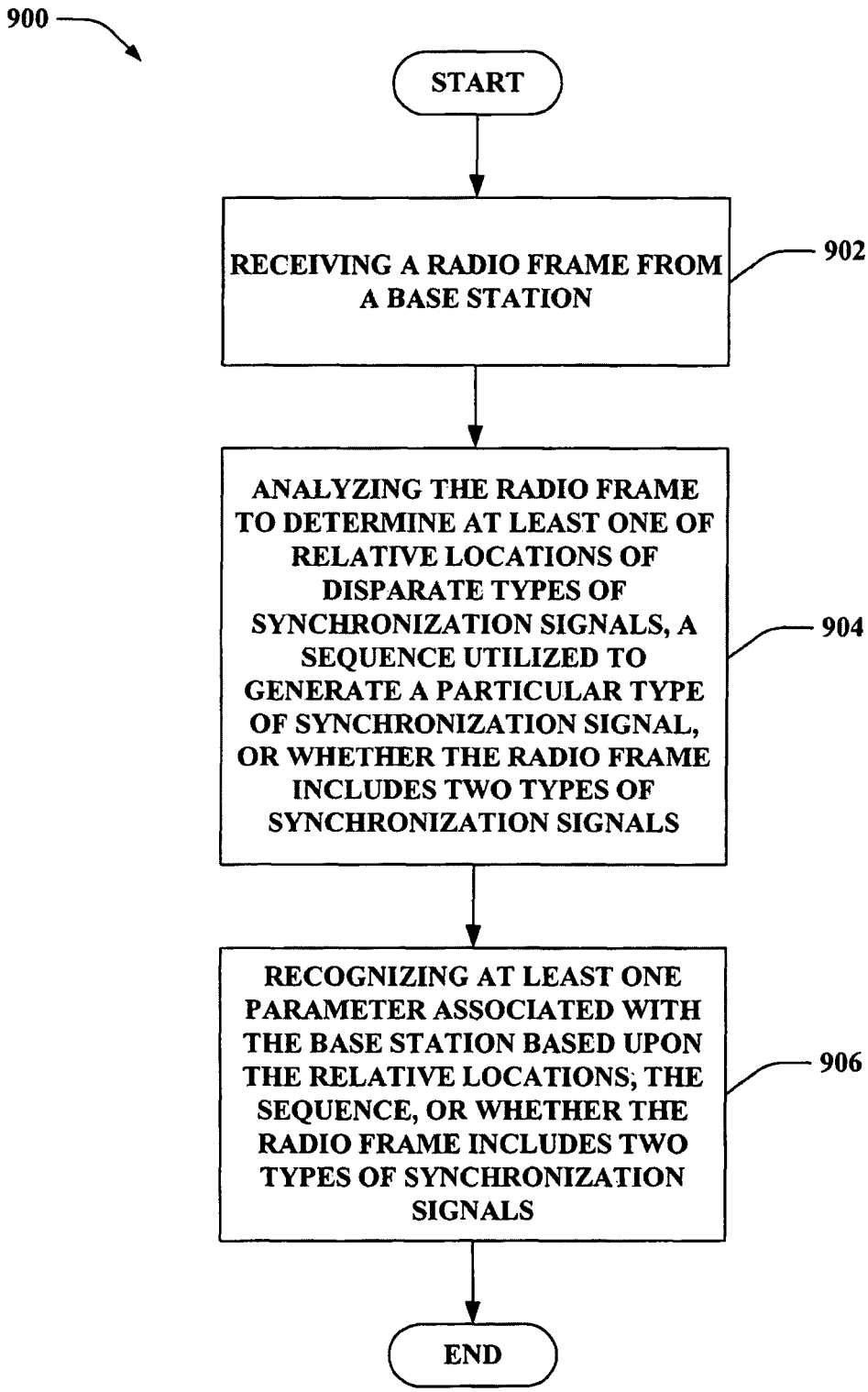
900
START
RECEIVING A RADIO FRAME FROM A BASE STATION
902
ANALYZING THE RADIO FRAME TO DETERMINE AT LEAST ONE OF RELATIVE LOCATIONS OF DISPARATE TYPES OF SYNCHRONIZATION SIGNALS, A SEQUENCE UTILIZED TO GENERATE A PARTICULAR TYPE OF SYNCHRONIZATION SIGNAL, OR WHETHER THE RADIO FRAME INCLUDES TWO TYPES OF SYNCHRONIZATION SIGNALS
904
RECOGNIZING AT LEAST ONE PARAMETER ASSOCIATED WITH THE BASE STATION BASED UPON THE RELATIVE LOCATIONS, THE SEQUENCE, OR WHETHER THE RADIO FRAME INCLUDES TWO TYPES OF SYNCHRONIZATION SIGNALS
906
END

FIG. 9

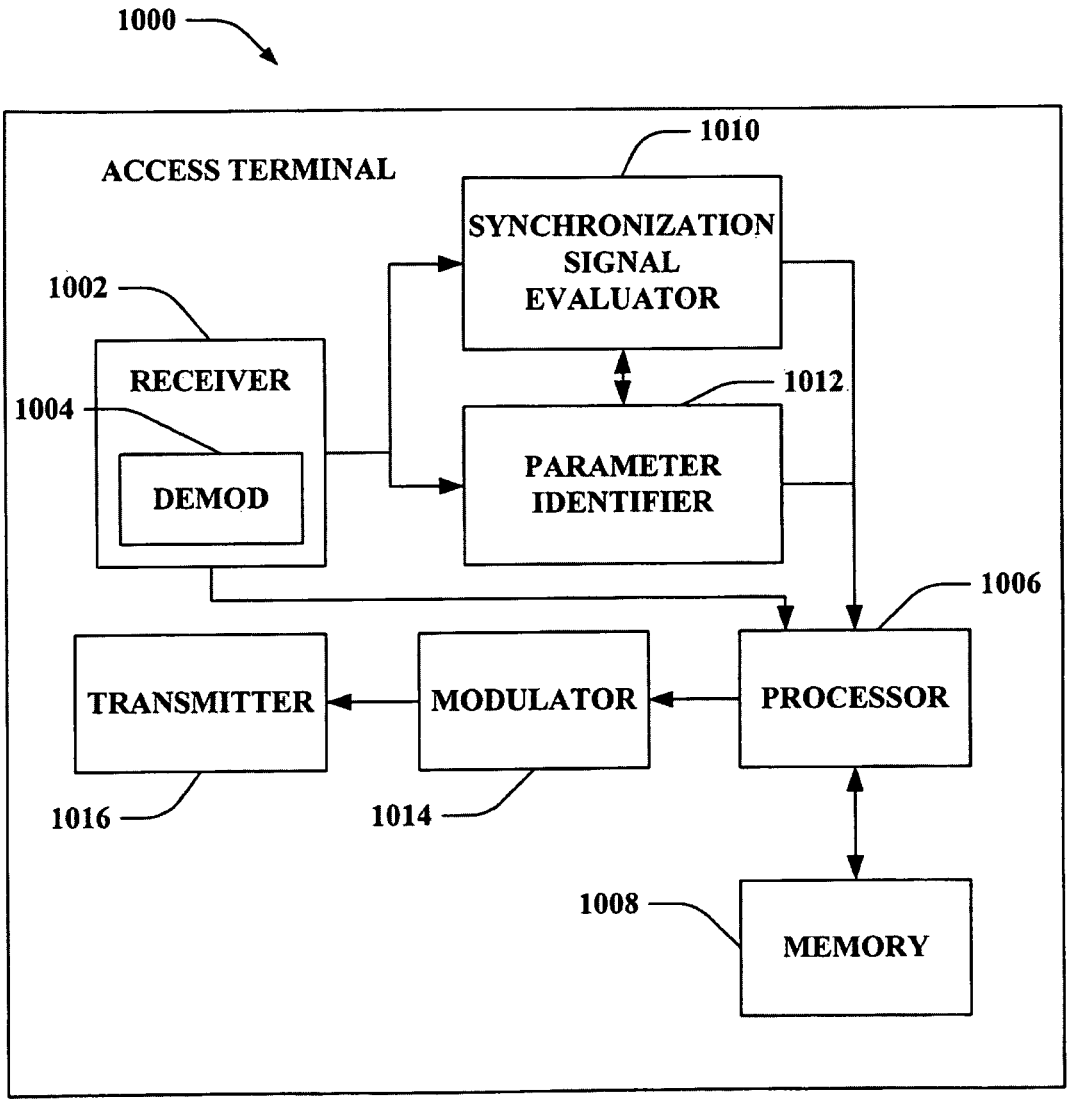
1000
ACCESS TERMINAL
1010
SYNCHRONIZATION SIGNAL EVALUATOR
1002
RECEIVER
1004
DEMOD
1012
PARAMETER IDENTIFIER
1006
TRANSMITTER
MODULATOR
PROCESSOR
1016
1014
1008
MEMORY

FIG. 10

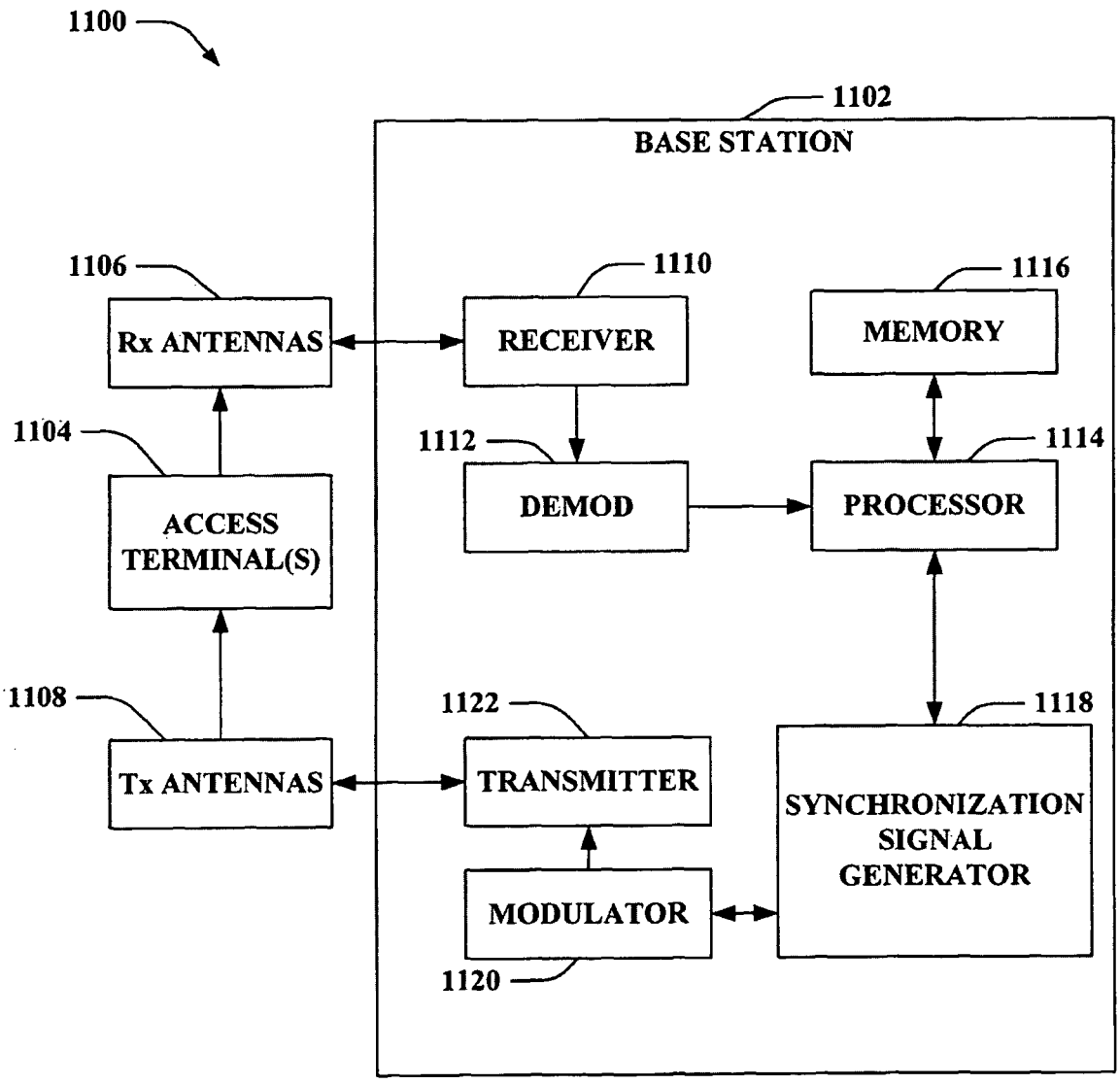
1100
1102
BASE STATION
1106
Rx ANTENNAS
1110
RECEIVER
1116
MEMORY
1104
ACCESS TERMINAL(S)
1112
DEMOD
1114
PROCESSOR
1108
Tx ANTENNAS
1122
TRANSMITTER
1118
SYNCHRONIZATION SIGNAL GENERATOR
MODULATOR
1120

FIG. 11

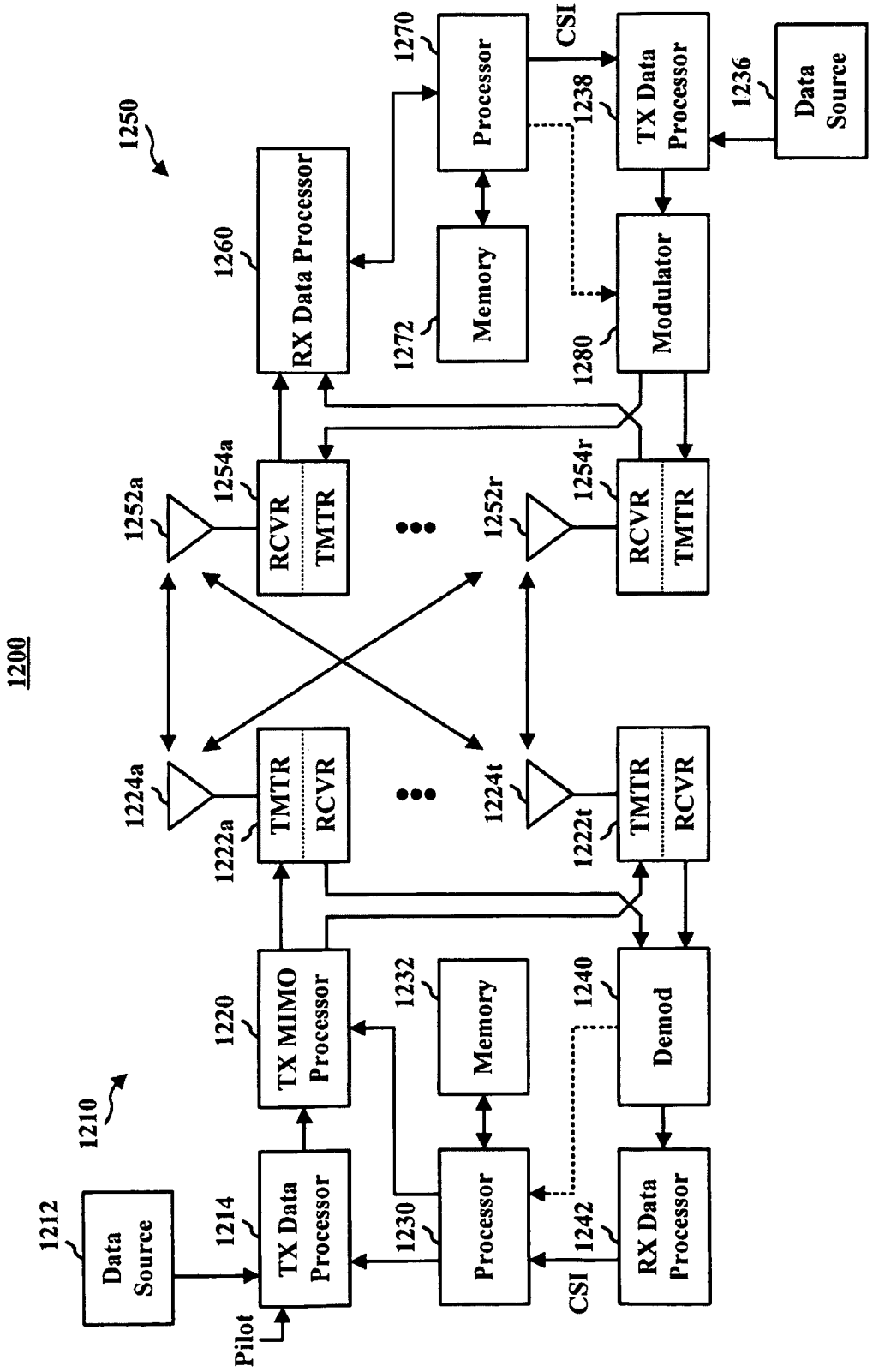
1200
1210
1212
Data Source
1214
TX Data Processor
Pilot
1220
TX MIMO Processor
1222a
TMTR
RCVR
1224a
1224t
1222t
1230
Processor
1232
Memory
1240
Demod
1242
RX Data Processor
CSI
1250
1252a
1252r
1254a
1254r
RCVR
TMTR
1260
RX Data Processor
1270
Processor
1272
Memory
1280
Modulator
CSI
1238
TX Data Processor
1236
Data Source

FIG. 12

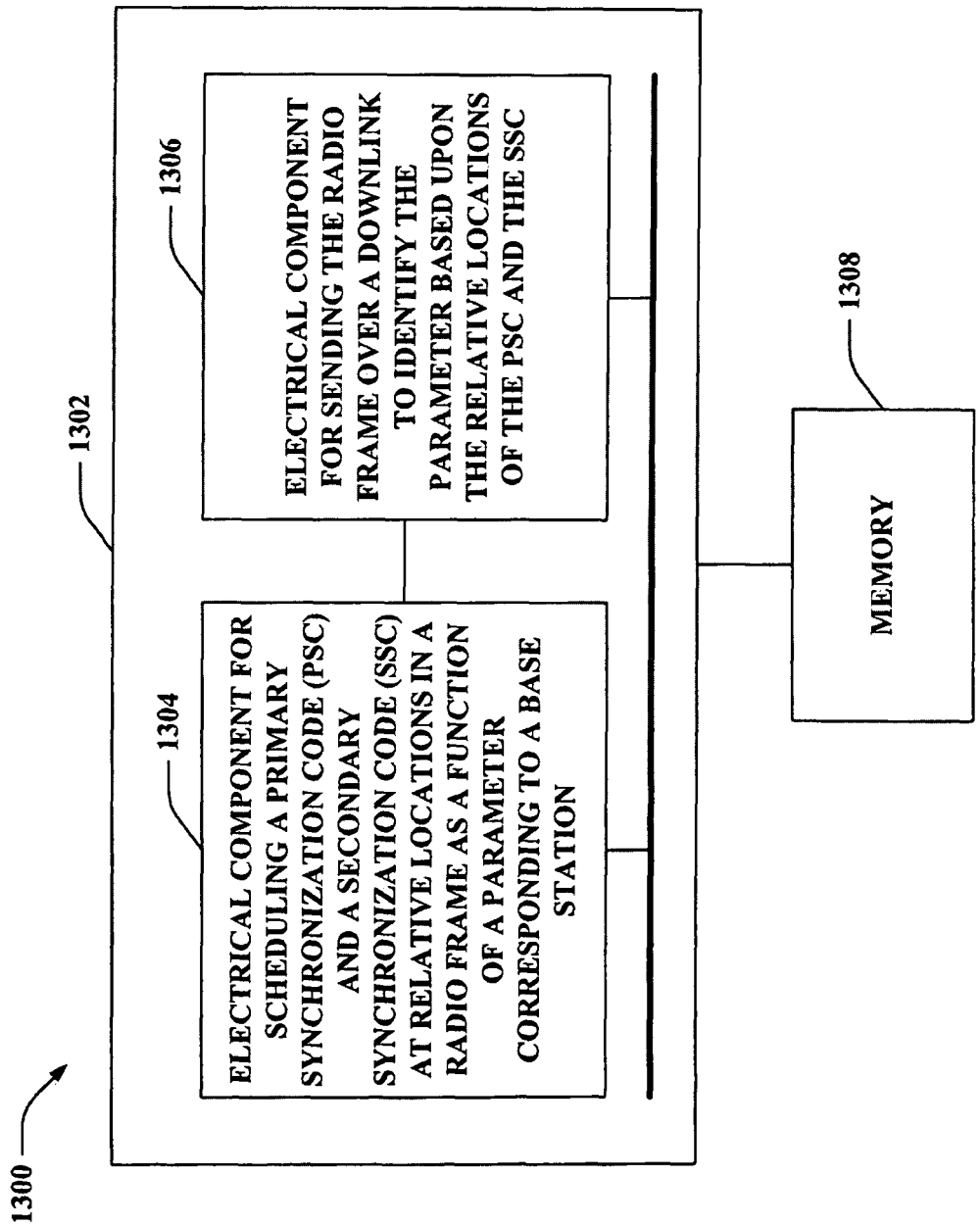
1300
1302
1304
ELECTRICAL COMPONENT FOR SCHEDULING A PRIMARY SYNCHRONIZATION CODE (PSC) AND A SECONDARY SYNCHRONIZATION CODE (SSC) AT RELATIVE LOCATIONS IN A RADIO FRAME AS A FUNCTION OF A PARAMETER CORRESPONDING TO A BASE STATION
1306
ELECTRICAL COMPONENT FOR SENDING THE RADIO FRAME OVER A DOWNLINK TO IDENTIFY THE PARAMETER BASED UPON THE RELATIVE LOCATIONS OF THE PSC AND THE SSC
1308
MEMORY

FIG. 13

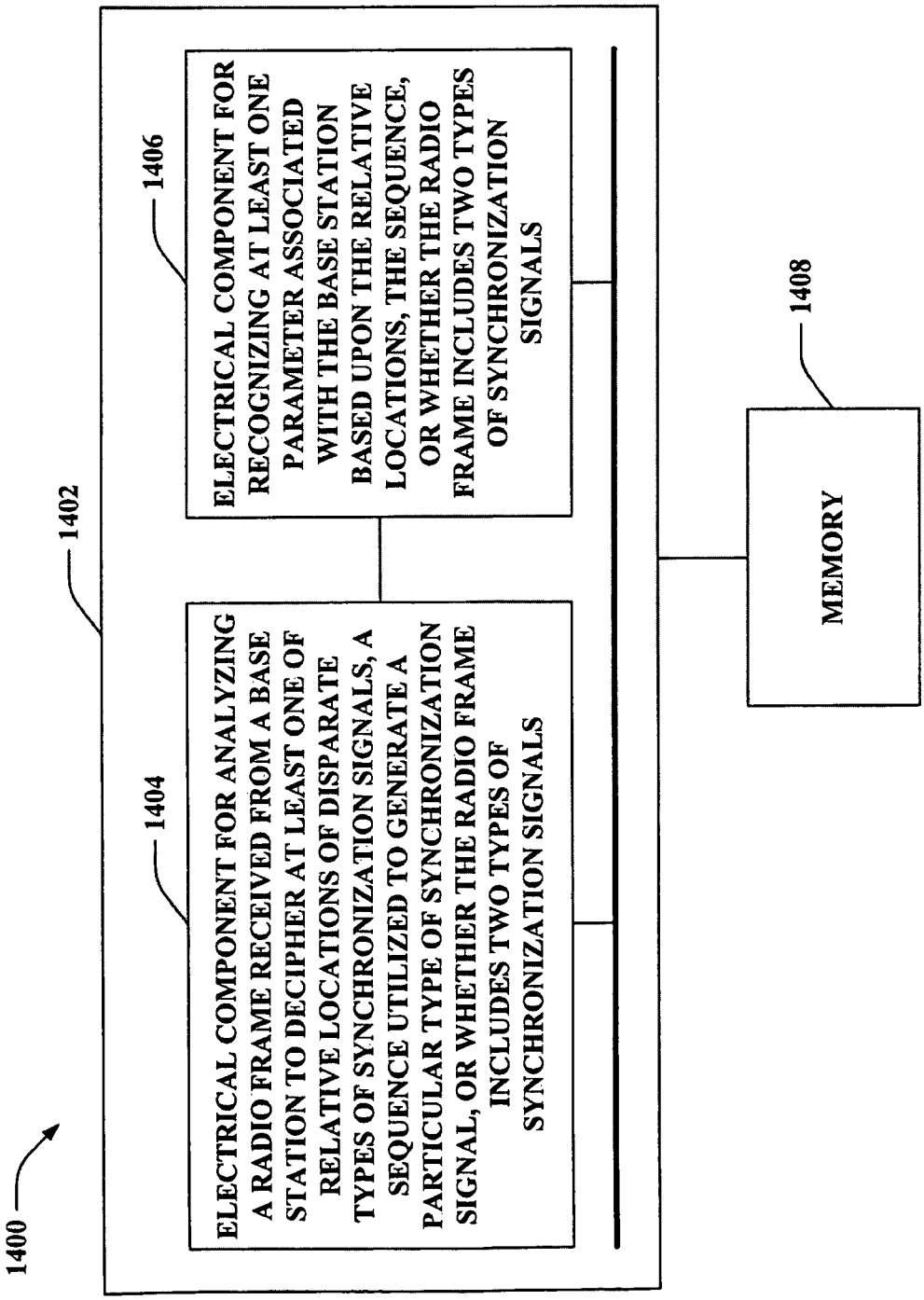
1400
1402
1404
ELECTRICAL COMPONENT FOR ANALYZING A RADIO FRAME RECEIVED FROM A BASE STATION TO DECIPHER AT LEAST ONE OF RELATIVE LOCATIONS OF DISPARATE TYPES OF SYNCHRONIZATION SIGNALS, A SEQUENCE UTILIZED TO GENERATE A PARTICULAR TYPE OF SYNCHRONIZATION SIGNAL, OR WHETHER THE RADIO FRAME INCLUDES TWO TYPES OF SYNCHRONIZATION SIGNALS
1406
ELECTRICAL COMPONENT FOR RECOGNIZING AT LEAST ONE PARAMETER ASSOCIATED WITH THE BASE STATION BASED UPON THE RELATIVE LOCATIONS, THE SEQUENCE, OR WHETHER THE RADIO FRAME INCLUDES TWO TYPES OF SYNCHRONIZATION SIGNALS
1408
MEMORY

FIG. 14

EFFICIENT SYSTEM IDENTIFICATION SCHEMES FOR COMMUNICATION SYSTEMS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Patent Application Ser. No. 60/979,056 entitled "EFFICIENT SYSTEM IDENTIFICATION SCHEMES FOR COMMUNICATION SYSTEMS" which was filed Oct. 10, 2007, U.S. Provisional Patent Application Ser. No. 60/982,265 entitled "EFFICIENT SYSTEM IDENTIFICATION SCHEMES FOR COMMUNICATION SYSTEMS" which was filed Oct. 24, 2007, and U.S. Provisional Patent Application Ser. No. 61/023,528 entitled "EFFICIENT SYSTEM IDENTIFICATION SCHEMES FOR COMMUNICATION SYSTEMS" which was filed Jan. 25, 2008. The entireties of the aforementioned applications are herein incorporated by reference.

BACKGROUND

I. Field

The following description relates generally to wireless communications, and more particularly to employing an efficient scheme for indicating system parameter(s) in a wireless communication system.

II. Background

Wireless communication systems are widely deployed to provide various types of communication; for instance, voice and/or data can be provided via such wireless communication systems. A typical wireless communication system, or network, can provide multiple users access to one or more shared resources (e.g., bandwidth, transmit power, . . .). For instance, a system can use a variety of multiple access techniques such as Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Code Division Multiplexing (CDM), Orthogonal Frequency Division Multiplexing (OFDM), and others.

Generally, wireless multiple-access communication systems can simultaneously support communication for multiple access terminals. Each access terminal can communicate with one or more base stations via transmissions on forward and reverse links. The forward link (or downlink) refers to the communication link from base stations to access terminals, and the reverse link (or uplink) refers to the communication link from access terminals to base stations. This communication link can be established via a single-in-single-out, multiple-in-single-out or a multiple-in-multiple-out (MIMO) system.

MIMO systems commonly employ multiple (N_T) transmit antennas and multiple (N_R) receive antennas for data transmission. A MIMO channel formed by the N_T transmit and N_R receive antennas can be decomposed into N_S independent channels, which can be referred to as spatial channels, where $N_S \leq \{N_T, N_R\}$. Each of the N_S independent channels corresponds to a dimension. Moreover, MIMO systems can provide improved performance (e.g., increased spectral efficiency, higher throughput and/or greater reliability) if the additional dimensionalities created by the multiple transmit and receive antennas are utilized.

MIMO systems can support various duplexing techniques to divide forward and reverse link communications over a common physical medium. For instance, frequency division duplex (FDD) systems can utilize disparate frequency regions for forward and reverse link communications. Further, in time division duplex (TDD) systems, forward and reverse link communications can employ a common frequency region so that the reciprocity principle allows estimation of the forward link channel from reverse link channel.

Wireless communication systems oftentimes employ one or more base stations that provide a coverage area. A typical base station can transmit multiple data streams for broadcast, multicast and/or unicast services, wherein a data stream may be a stream of data that can be of independent reception interest to an access terminal. An access terminal within the coverage area of such base station can be employed to receive one, more than one, or all the data streams carried by the composite stream. Likewise, an access terminal can transmit data to the base station or another access terminal.

Various parameter(s) can be associated with each base station in a wireless communication system. The parameter(s) can relate to radio frame structure type, duplexing technique, cell type, unicast versus multicast operation, and so forth. For example, the base station can utilize one of two possible radio frame structures (e.g., frame structure type **1** or frame structure type **2** as set forth in the Evolved UMTS Terrestrial Radio Access (E-UTRA) specification). Further, the base station can be part of a TDD system or a FDD system. Moreover, the base station can be associated with a macro cell or a femto cell. Additionally or alternatively, the base station can be part of a unicast system or a multicast system.

Conventionally, an access terminal lacks knowledge of parameter(s) associated with a base station with which it is interacting upon initialization of a connection therebetween. For instance, upon power-up, an access terminal can begin to transmit data to and/or receive data from a particular base station. However, the access terminal can be unaware of the radio frame structure type, duplexing technique, cell type, and/or unicast/multicast operation utilized by or associated with the base station with which it is communicating.

Common techniques employed by access terminals to identify various parameter(s) associated with corresponding base stations are oftentimes inefficient and time consuming. By way of illustration, an access terminal typically effectuates acquisition by decoding information sent over a broadcast channel as well as subsequently transferred information. Thus, signals sent by the base station are commonly decoded to determine one or more of the aforementioned parameters. However, decoding of these signals can be difficult at best when such parameter(s) are unknown. According to an example, an access terminal can be unable to differentiate between use of frame structure type **1** and frame structure type **2** when employing blind cyclic prefix (CP) detection.

SUMMARY

The following presents a simplified summary of one or more embodiments in order to provide a basic understanding of such embodiments. This summary is not an extensive overview of all contemplated embodiments, and is intended to neither identify key or critical elements of all embodiments nor delineate the scope of any or all embodiments. Its sole purpose is to present some concepts of one or more embodiments in a simplified form as a prelude to the more detailed description that is presented later.

In accordance with one or more embodiments and corresponding disclosure thereof, various aspects are described in connection with facilitating efficient indication of parameter(s) associated with a base station utilizing synchronization signals in a wireless communication environment. For instance, relative locations of a PSC and a SSC in a radio frame can be a function of a parameter. Further, a PSC

sequence utilized to generate PSCs can be selected based upon a parameter. Moreover, inclusion or exclusion of PSCs from a radio frame can be a function of a parameter. Additionally or alternatively, pseudo random sequence mappings (e.g., to cell IDs, tone locations) can be a function of a parameter. Example parameters can be whether the base station is part of a TDD or a FDD system, whether the radio frame employs FS**1** or FS**2**, whether the base station is associated with a macro or a femto cell, or whether the base station is associated with a unicast or a multicast system.

According to related aspects, a method that facilitates identifying one or more parameters related to a base station in a wireless communication environment is described herein. The method can include generating a primary synchronization code (PSC) and a secondary synchronization code (SSC). Further, the method can comprise scheduling the PSC and the SSC at relative locations in a radio frame as a function of a first parameter corresponding to a base station. Moreover, the method can include transmitting the radio frame over a downlink to indicate the first parameter based upon the relative locations of the PSC and the SSC.

Another aspect relates to a wireless communications apparatus. The wireless communications apparatus can include a memory that retains instructions related to selecting a primary synchronization code (PSC) sequence based upon a first parameter of a base station, generating a primary synchronization code (PSC) based upon the selected PSC sequence, and transmitting a radio frame that includes the generate PSC over a downlink to indicate the first parameter based upon the selected PSC sequence. Further, the wireless communications apparatus can include a processor, coupled to the memory, configured to execute the instructions retained in the memory.

Yet another aspect relates to a wireless communications apparatus that enables efficiently indicating one or more parameters to at least one access terminal in a wireless communication environment. The wireless communications apparatus can include means for scheduling a primary synchronization code (PSC) and a secondary synchronization code (SSC) at relative locations in a radio frame as a function of a first parameter corresponding to a base station. Further, the wireless communications apparatus can include means for sending the radio frame over a downlink to identify the first parameter based upon the relative locations of the PSC and the SSC.

Still another aspect relates to a computer program product that can comprise a computer-readable medium. The computer-readable medium can include code for selecting a primary synchronization code (PSC) sequence based upon a first parameter of a base station. Further, the computer-readable medium can include code for generating a primary synchronization code (PSC) based upon the selected PSC sequence. Moreover, the computer-readable medium can include code for transmitting a radio frame that includes the generate PSC over a downlink to indicate the first parameter based upon the selected PSC sequence.

In accordance with another aspect, an apparatus in a wireless communication system can include a processor, wherein the processor can be configured to schedule a primary synchronization code (PSC) and a secondary synchronization code (SSC) at relative locations in a radio frame as a function of a first parameter corresponding to a base station. Moreover, the processor can be configured to send the radio frame over a downlink to identify the first parameter based upon the relative locations of the PSC and the SSC.

According to other aspects, a method that facilitates deciphering at least one parameter corresponding to a base station in a wireless communication environment is described herein. The method can include receiving a radio frame from a base station. Moreover, the method can include analyzing the radio frame to determine at least one of relative locations of disparate types of synchronization signals, a sequence utilized to generate a particular type of synchronization signal, or whether the radio frame includes two types of synchronization signals. Further, the method can comprise recognizing at least one parameter associated with the base station based upon the relative locations, the sequence, or whether the radio frame includes two types of synchronization signals.

Yet another aspect relates to a wireless communications apparatus that can include a memory that retains instructions related to receiving a radio frame from a base station, analyzing the radio frame to determine at least one of relative locations of disparate types of synchronization signals, a sequence utilized to generate a particular type of synchronization signal, or whether the radio frame includes two types of synchronization signals, and recognizing at least one parameter associated with the base station based upon the relative locations, the sequence, or whether the radio frame includes two types of synchronization signals. Further, the wireless communications apparatus can comprise a processor, coupled to the memory, configured to execute the instructions retained in the memory.

Another aspect relates to a wireless communications apparatus that enables identifying one or more parameters relative to a base station in a wireless communication environment. The wireless communications apparatus can include means for analyzing a radio frame received from a base station to decipher at least one of relative locations of disparate types of synchronization signals, a sequence utilized to generate a particular type of synchronization signal, or whether the radio frame includes two types of synchronization signals. Further, the wireless communications apparatus can include means for recognizing at least one parameter associated with the base station based upon the relative locations, the sequence, or whether the radio frame includes two types of synchronization signals.

Still another aspect relates to a computer program product that can comprise a computer-readable medium. The computer-readable medium can include code for analyzing a radio frame received from a base station to decipher at least one of relative locations of disparate types of synchronization signals, a sequence utilized to generate a particular type of synchronization signal, or whether the radio frame includes two types of synchronization signals. Moreover, the computer-readable medium can comprise code for recognizing at least one parameter associated with the base station based upon the relative locations, the sequence, or whether the radio frame includes two types of synchronization signals.

In accordance with another aspect, an apparatus in a wireless communication system can include a processor, wherein the processor can be configured to evaluate a radio frame received from a base station to decipher at least one of relative locations of disparate types of synchronization signals, a sequence utilized to generate a particular type of synchronization signal, or whether the radio frame includes two types of synchronization signals. Further, the processor can be configured to determine at least one parameter associated with the base station based upon the relative locations, the sequence, or whether the radio frame includes two types of synchronization signals.

To the accomplishment of the foregoing and related ends, the one or more embodiments comprise the features hereinafter fully described and particularly pointed out in the

claims. The following description and the annexed drawings set forth in detail certain illustrative aspects of the one or more embodiments. These aspects are indicative, however, of but a few of the various ways in which the principles of various embodiments can be employed and the described embodiments are intended to include all such aspects and their equivalents.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an illustration of a wireless communication system in accordance with various aspects set forth herein.

FIG. **2** is an illustration of an example frame structure type **1** (FS**1**) radio frame.

FIG. **3** is an illustration of an example frame structure type **2** (FS**2**) radio frame.

FIG. **4** is an illustration of an example system that utilizes synchronization signals to indicate base station related parameter(s) in a wireless communication environment.

FIGS. **5-6** are illustrations of example radio frame structures that utilize relative positions of synchronization signals to disseminate information related to one or more parameters.

FIG. **7** is an illustration of an example methodology that facilitates identifying one or more parameters related to a base station in a wireless communication environment.

FIG. **8** is an illustration of an example methodology that facilitates indicating one or more parameters corresponding to a base station in a wireless communication environment.

FIG. **9** is an illustration of an example methodology that facilitates deciphering at least one parameter corresponding to a base station in a wireless communication environment.

FIG. **10** is an illustration of an example access terminal that recognizes parameter(s) associated with a base station utilizing an efficient identification scheme in a wireless communication system.

FIG. **11** is an illustration of an example system that utilizes synchronization signals to indicate parameter(s) to access terminals in a wireless communication environment.

FIG. **12** is an illustration of an example wireless network environment that can be employed in conjunction with the various systems and methods described herein.

FIG. **13** is an illustration of an example system that enables efficiently indicating one or more parameters to at least one access terminal in a wireless communication environment.

FIG. **14** is an illustration of an example system that enables identifying one or more parameters relative to a base station in a wireless communication environment.

DETAILED DESCRIPTION

Various embodiments are now described with reference to the drawings, wherein like reference numerals are used to refer to like elements throughout. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of one or more embodiments. It may be evident, however, that such embodiment(s) may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to facilitate describing one or more embodiments.

As used in this application, the terms "component," "module," "system," and the like are intended to refer to a computer-related entity, either hardware, firmware, a combination of hardware and software, software, or software in execution. For example, a component can be, but is not limited to being, a process running on a processor, a processor, an object, an executable, a thread of execution, a program, and/or a computer. By way of illustration, both an application running on a computing device and the computing device can be a component. One or more components can reside within a process and/or thread of execution and a component can be localized on one computer and/or distributed between two or more computers. In addition, these components can execute from various computer readable media having various data structures stored thereon. The components can communicate by way of local and/or remote processes such as in accordance with a signal having one or more data packets (e.g., data from one component interacting with another component in a local system, distributed system, and/or across a network such as the Internet with other systems by way of the signal).

The techniques described herein can be used for various wireless communication systems such as code division multiple access (CDMA), time division multiple access (TDMA), frequency division multiple access (FDMA), orthogonal frequency division multiple access (OFDMA), single carrier-frequency division multiple access (SC-FDMA) and other systems. The terms "system" and "network" are often used interchangeably. A CDMA system can implement a radio technology such as Universal Terrestrial Radio Access (UTRA), CDMA2000, etc. UTRA includes Wideband-CDMA (W-CDMA) and other variants of CDMA. CDMA2000 covers IS-2000, IS-95 and IS-856 standards. A TDMA system can implement a radio technology such as Global System for Mobile Communications (GSM). An OFDMA system can implement a radio technology such as Evolved UTRA (E-UTRA), Ultra Mobile Broadband (UMB), IEEE 802.11 (Wi-Fi), IEEE 802.16 (WiMAX), IEEE 802.20, Flash-OFDM, etc. UTRA and E-UTRA are part of Universal Mobile Telecommunication System (UMTS). 3GPP Long Term Evolution (LTE) is an upcoming release of UMTS that uses E-UTRA, which employs OFDMA on the downlink and SC-FDMA on the uplink.

Single carrier frequency division multiple access (SC-FDMA) utilizes single carrier modulation and frequency domain equalization. SC-FDMA has similar performance and essentially the same overall complexity as those of an OFDMA system. A SC-FDMA signal has lower peak-to-average power ratio (PAPR) because of its inherent single carrier structure. SC-FDMA can be used, for instance, in uplink communications where lower PAPR greatly benefits access terminals in terms of transmit power efficiency. Accordingly, SC-FDMA can be implemented as an uplink multiple access scheme in 3GPP Long Term Evolution (LTE) or Evolved UTRA.

Furthermore, various embodiments are described herein in connection with an access terminal. An access terminal can also be called a system, subscriber unit, subscriber station, mobile station, mobile, remote station, remote terminal, mobile device, user terminal, terminal, wireless communication device, user agent, user device, or user equipment (UE). An access terminal can be a cellular telephone, a cordless telephone, a Session Initiation Protocol (SIP) phone, a wireless local loop (WLL) station, a personal digital assistant (PDA), a handheld device having wireless connection capability, computing device, or other processing device connected to a wireless modem. Moreover, various embodiments are described herein in connection with a base station. A base station can be utilized for communicating with access terminal(s) and can also be referred to as an access point, Node B, Evolved Node B (eNodeB) or some other terminology.

Moreover, various aspects or features described herein can be implemented as a method, apparatus, or article of manufacture using standard programming and/or engineering techniques. The term "article of manufacture" as used herein is

intended to encompass a computer program accessible from any computer-readable device, carrier, or media. For example, computer-readable media can include but are not limited to magnetic storage devices (e.g., hard disk, floppy disk, magnetic strips, etc.), optical disks (e.g., compact disk (CD), digital versatile disk (DVD), etc.), smart cards, and flash memory devices (e.g., EPROM, card, stick, key drive, etc.). Additionally, various storage media described herein can represent one or more devices and/or other machine-readable media for storing information. The term "machine-readable medium" can include, without being limited to, wireless channels and various other media capable of storing, containing, and/or carrying instruction(s) and/or data.

Referring now to FIG. **1**, a wireless communication system **100** is illustrated in accordance with various embodiments presented herein. System **100** comprises a base station **102** that can include multiple antenna groups. For example, one antenna group can include antennas **104** and **106**, another group can comprise antennas **108** and **110**, and an additional group can include antennas **112** and **114**. Two antennas are illustrated for each antenna group; however, more or fewer antennas can be utilized for each group. Base station **102** can additionally include a transmitter chain and a receiver chain, each of which can in turn comprise a plurality of components associated with signal transmission and reception (e.g., processors, modulators, multiplexers, demodulators, demultiplexers, antennas, etc.), as will be appreciated by one skilled in the art.

Base station **102** can communicate with one or more access terminals such as access terminal **116** and access terminal **122**; however, it is to be appreciated that base station **102** can communicate with substantially any number of access terminals similar to access terminals **116** and **122**. Access terminals **116** and **122** can be, for example, cellular phones, smart phones, laptops, handheld communication devices, handheld computing devices, satellite radios, global positioning systems, PDAs, and/or any other suitable device for communicating over wireless communication system **100**. As depicted, access terminal **116** is in communication with antennas **112** and **114**, where antennas **112** and **114** transmit information to access terminal **116** over a forward link **118** and receive information from access terminal **116** over a reverse link **120**. Moreover, access terminal **122** is in communication with antennas **104** and **106**, where antennas **104** and **106** transmit information to access terminal **122** over a forward link **124** and receive information from access terminal **122** over a reverse link **126**. In a frequency division duplex (FDD) system, forward link **118** can utilize a different frequency band than that used by reverse link **120**, and forward link **124** can employ a different frequency band than that employed by reverse link **126**, for example. Further, in a time division duplex (TDD) system, forward link **118** and reverse link **120** can utilize a common frequency band and forward link **124** and reverse link **126** can utilize a common frequency band.

Each group of antennas and/or the area in which they are designated to communicate can be referred to as a sector of base station **102**. For example, antenna groups can be designed to communicate to access terminals in a sector of the areas covered by base station **102**. In communication over forward links **118** and **124**, the transmitting antennas of base station **102** can utilize beamforming to improve signal-to-noise ratio of forward links **118** and **124** for access terminals **116** and **122**. Also, while base station **102** utilizes beamforming to transmit to access terminals **116** and **122** scattered randomly through an associated coverage, access terminals in neighboring cells can be subject to less interference as compared to a base station transmitting through a single antenna to all its access terminals.

System **100** employs an efficient scheme for identifying system parameter(s). Base station **102** can utilize synchronization signals to indicate one or more parameters associated with base station **102** to access terminals **116** and **122**. By employing synchronization signals to provide notification as to various parameter(s) associated with base station **102**, blind decoding of downlink information by access terminals **116** and **122** without knowledge of such parameter(s) can be mitigated. Thus, access terminals **116** and **122** can use the synchronization signals to identify parameter(s) without effectuating blind decoding of information sent over the downlink, which leads to more efficient notification of such parameter(s) to access terminals **116** and **122**.

One or more parameters can be indicated to access terminals **116** and **122** via the synchronization signals. For instance, the synchronization signals can inform access terminals **116** and **122** whether base station **102** employs frame structure type **1** (FS**1**) or frame structure type **2** (FS**2**). According to another illustration, the synchronization signals can indicate to access terminals **116** and **122** whether base station **102** is part of a time division duplex (TDD) system or a frequency division duplex (FDD) system. Pursuant to another example, the synchronization signals can specify to access terminals **116** and **122** whether base station **102** is associated with a macro cell or a femto cell. Additionally or alternatively, the synchronization signals can notify access terminals **116** whether base station **102** is associated with a unicast system or a multicast system. It is to be appreciated, however, that the claimed subject matter is not limited to the aforementioned example parameters; rather, any other parameters related to base station **102** are intended to fall within the scope of the hereto appended claims.

One or more types of synchronization signals can be transmitted by base station **102**. For instance, a primary synchronization code (PSC) signal and/or a secondary synchronization code (SSC) signal can be transferred by base station **102**. A primary synchronization code signal can be a synchronization signal used for cell detection during initial cell search and a secondary synchronization code signal can be a synchronization signal used for cell identification during initial cell search.

A primary synchronization signal can be generated based on a PSC sequence and referred to as a PSC signal. The PSC sequence can be a constant amplitude zero auto correlation (CAZAC) sequence, a pseudo-random number (PN) sequence, etc. Some example CAZAC sequences include a Chu sequence, a Zadoff-Chu sequence, a Frank sequence, a generalized chirp-like (GCL) sequence, and the like. A secondary synchronization signal can be generated based on a SSC sequence and referred to as a SSC signal. The SSC sequence can be a maximum-length sequence (M-sequence), a PN sequence, a binary sequence, etc. Further, the PSC signal can be referred to as the primary synchronization signal, PSC, etc. and the SSC signal can be referred to as the secondary synchronization signal, SSC, etc.

In system **100**, parameters corresponding to base station **102** can be indicated based upon one or more factors corresponding to the synchronization signals such as relative location of different types of synchronization signals within a radio frame, selected sequence utilized to generate the synchronization signals of a given type, inclusion or exclusion of a particular type of synchronization signal, and so forth. In contrast, conventional techniques oftentimes leverage blind detection of cyclic prefixes (CPs) by access terminals for

attempting to identify parameters, which can be ineffective and/or inefficient. For instance, CP lengths can be different between FS2 and FS1 in PSC and SSC (e.g., 8.33 microseconds (us) and 17.71 us for PSC and SSC, respectively, for FS2 versus 5.21 us and 16.67 us for PSC and SSC, respectively, for FS1). CP can be blindly detected between normal CP (e.g., 5.21 us) and extended CP (e.g., 16.67 us) for FS1 by an access terminal. Further, an access terminal can utilize blind CP detection for FS2 to differentiate normal CP (e.g., 8.33 us) and extended CP (e.g., 17.71 us). As a result, such conventional techniques using CP blind detection can be unable to differentiate FS1 from FS2.

Further, primary broadcast channel (PBCH) locations can be different between FS1 and FS2. Blind PBCH decoding, oftentimes effectuated by common approaches, can be carried out by doubling access terminal PBCH decoding complexity (e.g., 24 blind decoding including blind antenna detection and 40 ms frame boundary detection during initial acquisition per 10 ms) to differentiate FS1 from FS2. In addition, SSC detection can be doubled due to four different CP lengths being utilized unless unification is leveraged; however, unification can be cost-prohibitive given that FS2 can assume that guard gap (GP) is absorbed in CP unless FS1 pays higher overheads for FDD normal CP). Thus, common techniques can inefficiently differentiate FS1 from FS2.

Moreover, conventional techniques can fail to provide sufficient guard time between downlink pilot time slot (DwPTS) and uplink pilot time slot (UpPTS) for FS2. In contrast, system **100** can provide a larger guard time for uplink and downlink switching.

Now referring to FIGS. **2-3**, illustrated are example radio frame structures. Two radio frame structures are set forth in the E-UTRA specification: namely, frame structure type **1** (FS1) and frame structure type **2** (FS2). FS1 can be applicable to both FDD and TDD systems, while FS2 can be applicable to TDD systems. It is to be appreciated that FIGS. **2-3** are provided for illustrative purposes and the disclosed subject matter is not limited to the scope of these examples (e.g., radio frames with any duration, number of subframes, number of slots, and the like can be employed, . . .).

Turning to FIG. **2**, illustrated is an example frame structure type **1** (FS1) radio frame **200**. FS1 radio frame **200** can be utilized in connection with FDD or TDD. Further, FS1 radio frame **200** can be a 10 ms radio frame that includes 20 slots (e.g., slot **0**, . . . , slot **19**), where each of the slots has a duration of 0.5 ms. Moreover, two adjacent slots (e.g., slots **0** and **1**, slots **2** and **3**, . . .) from FS1 radio frame **200** can make up one subframe with a duration of 1 ms; accordingly, FS1 radio frame **200** can include 10 subframes.

With reference to FIG. **3**, illustrated is an example frame structure type **2** (FS2) radio frame **300**. FS2 radio frame **300** can be employed in connection with TDD. FS2 radio frame **300** can be a 10 ms radio frame that includes 10 subframes. Further, FS2 radio frame **300** can include two substantially similar half-frames (e.g., half-frame **302** and half-frame **304**), each of which can have a duration of 5 ms. Each of the half-frames **302-304** can include eight slots, each with a duration of 0.5 ms, and three fields (e.g., DwPTS, GP, and UpPTS) that each have configurable individual lengths and a total length of 1 ms. A subframe includes two adjacent slots, except for subframes **1** and **6**, which include DwPTS, GP, and UpPTS.

Referring to FIG. **4**, illustrated is a system **400** that utilizes synchronization signals to indicate base station related parameter(s) in a wireless communication environment. System **400** includes a base station **402** that can transmit and/or receive information, signals, data, instructions, commands, bits, symbols, and the like. Base station **402** can communicate with an access terminal **404** via the forward link and/or reverse link. Access terminal **404** can transmit and/or receive information, signals, data, instructions, commands, bits, symbols, and the like. Moreover, although not shown, it is contemplated that any number of base stations similar to base station **402** can be included in system **400** and/or any number of access terminals similar to access terminal **404** can be included in system **400**.

Base station **402** can be associated with one or more parameter(s) **406** that are to be disseminated to access terminal **404** via synchronization signals. Further, base station **402** can include a synchronization signal generator **408** that yields synchronization signals for downlink transmission as a function of the one or more parameter(s) **406** corresponding to base station **402**. For example, synchronization signal generator **408** can yield synchronization signal(s) for transmission based upon a chosen sequence, schedule types of synchronization signal(s) within a radio frame, enable or inhibit inclusion of a given type of synchronization signal, choose a pseudo-random sequence to be employed, a combination thereof, and so forth based upon the parameter(s) **406** of base station **402** being indicated to access terminal **404**. Moreover, the synchronization signals provided by synchronization signal generator **408** can be transmitted to access terminal **404**.

Access terminal **404** can receive the synchronization signals from base station **402** and determine parameter(s) associated with base station **402** based upon the received synchronization signals. Access terminal **404** can further include a synchronization signal evaluator **410** and a parameter identifier **412**. Synchronization signal evaluator **410** can analyze the received synchronization signals. By way of illustration, synchronization signal evaluator **410** can determine an identity of a sequence pertaining to a given type of received synchronization signals, relative locations of different types of synchronization signals within a radio frame, inclusion or exclusion of a given type of synchronization signal, pseudo-random sequence utilized, a combination thereof, etc. Further, based upon the analysis, parameter identifier **412** can recognize parameter(s) associated with base station **402**. Parameter identifier **412** can leverage the analysis of the received synchronization signals effectuated by synchronization signal evaluator **410** to decipher the parameter(s) corresponding to base station **402** based upon a priori knowledge of how synchronization signal generator **408** selects, schedules, etc. synchronization signals. For example, the relative location of different types of synchronization signals in a radio frame as recognized by synchronization signal evaluator **410** can be utilized by parameter identifier **412** to determine whether frame structure type **1** or frame structure type **2** is employed by base station **402**; however, it is to be appreciated that the claimed subject matter is not limited to such example.

Synchronization signal generator **408** of base station **402** can include a selector **414** that can determine a synchronization code sequence to employ for generating synchronization signals. Different PSC sequences can be elected by selector **414** as a function of a parameter **406**, and PSCs can be yielded based upon the selected PSC sequences by synchronization signal generator **408** for transmission over the downlink. Thus, synchronization signal evaluator **410** can detect which PSC sequence is chosen by selector **414** and used by synchronization signal generator **408** for received synchronization signals (e.g., PSCs, . . .), and parameter identifier **412** can recognize the parameter corresponding to the detected PSC sequence.

For example, different PSC sequences can be chosen by selector **414** for use by synchronization signal generator **408** to differentiate between FS**1** and FS**2**. Conventional systems oftentimes employ three PSC sequences (e.g., two of these three PSC sequences can be complex conjugates of each other, . . .). In contrast, system **400** can add one additional PSC sequence (e.g., a fourth PSC sequence, . . .). The fourth PSC sequence can be defined in the frequency domain as a complex conjugate of the PSC sequence out of the three commonly employed PSC sequences from conventional systems that is not a complex conjugate of the other two PSC sequences. Further, selector **414** can choose to utilize the three commonly employed PSC sequences if base station **402** utilizes FS**1** and the additional, fourth PSC sequence if base station **402** employs FS**2**. Thus, one PSC sequence can be used to indicate FS**2**, while three PSC sequences can be utilized to signify FS**1**. Accordingly, synchronization signal evaluator **410** can attempt to detect these four PSC sequences. If one of the three commonly employed PSC sequences is detected by synchronization signal evaluator **410**, then parameter identifier **412** can recognize that base station **402** utilizes FS**1**. Alternatively, if the fourth PSC sequence is detected by synchronization signal evaluator **410**, then parameter identifier **412** can determine that base station **402** employs FS**2**. According to another illustration, it is contemplated that the fourth PSC sequence can be leveraged to identify use of FS**1** by base station **402**, while the other three commonly employed PSC sequences can be employed to identify use of FS**2** by base station **402**.

Pursuant to a further example, different PSC sequences can be utilized by selector **414** to indicate that base station **402** is associated with a unicast system or a multicast system. Following this example, selector **414** can choose a particular PSC sequence to be utilized by synchronization signal generator **408** for yielding PSCs to differentiate a Multimedia Broadcast over a Single Frequency Network (MBSFN) carrier from other FDD/TDD systems (e.g., unicast carrier, . . .). MBSFN can use a time-synchronized common waveform that is transmitted from multiple cells for a given duration; accordingly, multiple base stations (e.g., base station **402** and any number of disparate base station(s) (not shown), . . .) can send the same information to access terminal **404**. Further, the multicast system can use a MBSFN carrier, which can be a dedicated carrier. Thus, selector **414** can allow for identifying to access terminal **404** whether base station **402** uses a MBSFN carrier. Similar to the above example, four PSC sequences can be leveraged by system **400** (e.g., the three commonly employed PSC sequences and the additional, fourth sequence, . . .). Again, the fourth PSC sequence can be defined in the frequency domain as a complex conjugate of the PSC sequence out of the three commonly employed PSC sequences from conventional systems that is not a complex conjugate of the other two PSC sequences. Further, selector **414** can choose to utilize the three commonly employed PSC sequences if base station **402** utilizes a non-MBSFN carrier (e.g., unicast carrier, . . .) and the additional, fourth PSC sequence if base station **402** employs the MBSFN carrier. Thus, one PSC sequence can be used to indicate use of the MBSFN carrier, while three PSC sequences can be utilized to signify use of the non-MBSFN carrier. Accordingly, synchronization signal evaluator **410** can attempt to detect these four PSC sequences. If one of the three commonly employed PSC sequences is detected by synchronization signal evaluator **410**, then parameter identifier **412** can recognize that base station **402** utilizes a non-MBSFN carrier. Alternatively, if the fourth PSC sequence is detected by synchronization signal evaluator **410**, then parameter identifier **412** can determine that base station **402** employs a MBSFN carrier. According to another illustration, it is contemplated that the fourth PSC sequence can be leveraged to identify use of a non-MBSFN carrier by base station **402**, while the other three commonly employed PSC sequences can be employed to identify use of the MBSFN carrier by base station **402**. Similarly, it is also contemplated that different PSC sequences can be utilized to distinguish between base station **402** being associated with a femto cell versus a nominal cell (e.g., macro cell, . . .) and/or a TDD system versus a FDD system.

Synchronization signal generator **408** can additionally or alternatively include a scheduler **416** that schedules disparate types of synchronization signals within each radio frame as a function of parameter(s) **406** corresponding to base station **402**. Thus, scheduler **416** can determine and assign relative locations for PSC and SSC within the radio frame. Moreover, synchronization signal evaluator **410** can detect relative positions of PSC and SSC, and based thereupon, parameter identifier **412** can recognize one or more parameters associated with base station **402**. For instance, relative locations of PSC and SSC can be used to differentiate between base station **402** being associated with FS**1** versus FS**2**, TDD versus FDD, unicast versus multicast operation, and/or macro cell versus femto cell. Further, scheduler **416** can control locations of PSC and SSC within a radio frame. Locations of PSC and SSC can be used to represent different types/parts of the system information, which can be associated with TDD or FDD types systems, cells with different sizes or purposes, and so forth.

With reference to FIGS. **5**-**6**, illustrated are example radio frame structures **500** and **600** that utilize relative positions of synchronization signals to disseminate information related to one or more parameters. Each radio frame (e.g., radio frame t **502**, radio frame t **602**, . . .) can be partitioned into multiple (e.g., S, where S can be substantially any integer, . . .) slots (e.g., or a subset of the S slots can be replaced by fields as described herein for frame structure type **2**, . . .), and each slot can include multiple (e.g., T, where T can be substantially any integer, . . .) symbol periods. For example, each radio frame (e.g., radio frame **502**, radio frame **602**, . . .) can have a duration of 10 ms, and each slot can have a duration of 0.5 ms. Further, a subframe can include two adjacent slots (e.g., slot **0** and slot **1**, . . .). Moreover, each slot can cover **6** or **7** symbol periods depending on a cyclic prefix length. Although not shown, it is to be appreciated that a frame structure type **1** radio frame can include a subframe comprising slot **2** and slot **3** adjacent to the subframe comprising slot **0** and slot **1** (as well as a subframe comprising slot S/2+2 and slot S/2+3 adjacent to the subframe comprising slot S/2 and slot S/2+1), while a frame structure type **2** radio frame can include a subframe comprising fields (e.g., DwPTS, GP, and UpPTS) adjacent to the subframe comprising slot **0** and slot **1** (as well as another subframe comprising such fields adjacent to the subframe comprising slot S/2 and slot S/2+1). Also, it is contemplated that the radio frames can be partitioned in any disparate manner.

As illustrated, synchronization signals can be mapped to OFDM symbols included in slot **0** **504**, **604** and slot S/2 **506**, **606** (e.g., slot **10**, . . .). However, relative placement of PSC and SSC can differ (e.g., as controlled by scheduler **416** of FIG. **4**, . . .) between radio frame structures **500** and **600**. As shown in FIG. **5**, PSC is mapped to a last OFDM symbol (e.g., symbol **508**, symbol **510**, . . .) in slot **0** **504** and slot S/2 **506** (e.g., the first and eleventh slots, . . .), while SSC is mapped to an adjacent OFDM symbol (e.g., symbol **512**, symbol **514**, . . .) prior to the last OFDM symbol. Moreover, as shown in FIG. **6**, SSC is mapped to a last OFDM symbol (e.g.,

symbol **608**, symbol **610**, . . .) in slot **0 604** and slot S/2 **606** (e.g., the first and eleventh slots, . . .), while PSC is mapped to an adjacent OFDM symbol (e.g., symbol **612**, symbol **614**, . . .) prior to the last OFDM symbol.

Differences in relative positions of PSC and SSC can be a function of one or more parameters. For example, the relative positions of PSC and SSC in a preamble and a middle amble can depend on whether a base station transmits radio frames with FS**1** or FS**2**. Following this example, in FS**1**, PSC can be mapped to the last OFDM symbol in the first and eleventh slots and SSC can be next to PSC as shown in FIG. **5**. Moreover, in FS**2**, SSC can be mapped to the last OFDM symbol and PSC can be next to SSC as shown in FIG. **6**. Further, a receiving access terminal can detect the PSC and/or SSC to differentiate between such parameter(s). Thus, pursuant to the above example, the receiving access terminal can determine relative positions of PSC and SSC, which can thereafter be leveraged to distinguish whether the transmitting base station utilizes FS**1** or FS**2**. It is to be appreciated, however, that the claimed subject matter is not limited to the aforementioned example; rather, any disparate parameter(s) in addition to or instead of frame structure type can be indicated via the relative positions of PSC and SSC. Examples of these base station specific parameters can be, but are not limited to, whether the base station is associated with multicast versus unicast operation, employs TDD versus FDD, and/or is associated with a femto cell or a macro cell. For instance, PSC and SSC can be placed at different locations (e.g., in a preamble, middle amble, Nth subframe, . . .) so that an access terminal can differentiate different cell types (e.g., nominal/macro cell versus femto cell, where a femto cell can transmit at a lower power than other macro cells, . . .) based on such placements.

Although FIGS. **5-6** depict PSC and SSC being mapped to the last two adjacent OFDM symbols in slot **0 504**, **604** and slot S/2 **506**, **606**, it is to be appreciated that the claimed subject matter is not so limited. For instance, PSC and/or SSC can be transmitted in any slots in addition to or instead of slot **0 504**, **604** and slot S/2 **506**, **606**. Further, PSC and SSC can be mapped to any OFDM symbols within a slot. By way of another example, symbol separation between PSC and SSC (e.g., PSC and SSC being adjacent, separated by one, two, etc. symbols, . . .) can be a function of one or more parameters. According to a further illustration, PSC need not be transmitted; inclusion or exclusion of PSC can be a function of one or more parameters.

Referring again to FIG. **4**, scheduler **416** can also include or exclude PSC from a radio frame yielded for transmission as a function of one or more parameters, for example. Following this example, PSC can be eliminated in FS**2** operation mode (e.g., in TDD type systems, . . .). Further, the location for PSC in FS**2** can be used for additional guard time for uplink and downlink switching. Thus, one sequence can be defined for synchronization (e.g., SSC can be reserved but with a different sequence design from FS**1**, . . .).

By way of further illustration, synchronization signal generator **408** can employ differing pseudo-random sequences (PRSs) as a function of one or more parameters. For instance, depending on whether FS**1** or FS**2** is employed by base station **402**, different PRSs can be mapped to the same cell identifier (ID). The same PRSs can be reused between FS**1** and FS**2**, but with different mappings to cell IDs. Additionally or alternatively, PRSs can be mapped to different tone locations depending on whether FS**1** or FS**2** is employed.

In accordance with an example, PRS location in the frequency domain can be linked to cell ID. Different cells can have different locations for the PRS. Thus, to distinguish between different parameters, the same sequence can be used, but with different locations in the frequency domain. An access terminal can detect the PRS to be able to determine the associated parameters. According to an illustration, the PRS location can be used for validation purposes. Following this illustration, a parameter can be indicated based upon relative locations of PSC and SSC, PSC sequence selected to be utilized to generate PSCs, or inclusion/exclusion of PSC, and such parameter can also be notified to an access terminal via the PRS location for validation; however, the claimed subject matter is not so limited.

According to another example, different systems can use different scrambling codes on top of the SSC sequences so that access terminal **404** can use this information to differentiate such systems. For instance, this information can be used to differentiate a TDD system versus a FDD system, a nominal (e.g., macro, . . .) cell versus a femto cell, a unicast system versus a multicast system (e.g., MBSFN, . . .), FS**1** versus FS**2**, and so forth. Hence, a particular scrambling code can be selected as a function of a parameter.

Pursuant to another illustration, in E-UTRAN, three PSC based scrambling sequences (SC) can be defined to scramble SSC sequences, where each scrambling sequence can be determined by an index of a corresponding PSC sequence. N additional different scrambling sequences can be used to scramble SSC sequences. As a result, (SC**1**, SC**2**, SC**3**) can be used for a FDD system, while (SC**4**, SC**5**, SC**6**) can be used for a TDD system. Similarly, (SC**7**, SC**8**, . . . SCN) can be used for femto cells, and so forth. Thus, a set of scrambling codes out of a plurality of possible sets can be selected as a function of a parameter.

Referring to FIGS. **7-9**, methodologies relating to efficiently indicating parameter(s) in a wireless communication environment are illustrated. While, for purposes of simplicity of explanation, the methodologies are shown and described as a series of acts, it is to be understood and appreciated that the methodologies are not limited by the order of acts, as some acts can, in accordance with one or more embodiments, occur in different orders and/or concurrently with other acts from that shown and described herein. For example, those skilled in the art will understand and appreciate that a methodology could alternatively be represented as a series of interrelated states or events, such as in a state diagram. Moreover, not all illustrated acts can be required to implement a methodology in accordance with one or more embodiments.

With reference to FIG. **7**, illustrated is a methodology **700** that facilitates identifying one or more parameters related to a base station in a wireless communication environment. At **702**, a primary synchronization code (PSC) and a secondary synchronization code (SSC) can be generated. For instance, the PSC can be generated based upon a PSC sequence and the SSC can be generated based upon a SSC sequence. At **704**, the PSC and the SSC can be scheduled at relative locations in a radio frame as a function of a parameter corresponding to a base station. According to an illustration, the parameter can be whether the base station is part of a TDD system or a FDD system. By way of another example, the parameter can be whether the radio frame employs frame structure type **1** (FS**1**) or frame structure type **2** (FS**2**). Moreover, the parameter can be whether the base station is associated with a macro cell or a femto cell. Pursuant to a further example, the parameter can be whether the base station is associated with a unicast system or a multicast system. Any relative locations for the PSC and the SSC can be utilized to differentiate between parameters. For instance, whether the PSC or the SSC is mapped to an earlier OFDM symbol in one or more slots of the radio frame can be a function of the parameter. According to another example, symbol separation between the PSC and the SSC

can be a function of the parameter. At **706**, the radio frame can be transmitted over a downlink to indicate the parameter based upon the relative locations of the PSC and the SSC.

By way of example, the PSC can be mapped to a last OFDM symbol in one or more slots of the radio frame, while the SSC can be mapped to an adjacent OFDM symbol immediately prior to the last OFDM symbol when FS**1** is employed. Following this example, the SSC can be mapped to the last OFDM symbol in one or more slots of the radio frame, while the PSC can be mapped to the adjacent OFDM symbol immediately prior to the last OFDM symbol when FS**2** is utilized. Based upon the transmitted radio frame, an access terminal can detect the relative locations of the PSC and the SSC to determine whether FS**1** or FS**2** is employed. It is to be appreciated, however, that the claimed subject matter is not limited to the aforementioned example.

According to another illustration (as described below), the PSC sequence utilized to generate the PSC for inclusion in the radio frame can be selected as a function of a parameter, which can be the same or differ from the parameter indicated via the relative locations. By way of further example, different pseudo random sequences (PRSs) can be mapped to a common cell ID as a function of a parameter (e.g., same or different parameter as indicated via the relative locations, . . .). Additionally or alternatively, PRSs can be mapped to different tone locations based upon a parameter (e.g., same or different parameter as indicated via the relative locations, . . .). For instance, PRS mappings can be leveraged as a validation mechanism for the parameter indicated by way of the relative locations of the PSC and the SSC; however, the claimed subject matter is not so limited. According to another illustration, the PSC can be eliminated from the radio frame when utilizing FS**2**; however, the claimed subject matter is not so limited. By way of further example, a particular scrambling code from a set of possible scrambling codes can be selected to be employed on top of a SSC sequence to yield the SSC as a function of a parameter. Additionally or alternatively, a set of possible scrambling codes, from which a particular scrambling code can be chosen to be utilized on top of a SSC sequence to generate the SSC, can be selected as a function of a parameter.

Now turning to FIG. **8**, illustrated is a methodology **800** that facilitates indicating one or more parameters corresponding to a base station in a wireless communication environment. At **802**, a primary synchronization code (PSC) sequence can be selected based upon a parameter of a base station. For instance, four possible PSC sequences can be employed, which can include three commonly utilized PSC sequences and one additional PSC sequence. Two of the commonly utilized PSC sequences can be complex conjugates of each other, while the third of the commonly utilized PSC sequences and the fourth, additional PSC sequence can be complex conjugates of each other. Further, either one of the three commonly utilized PSC sequences or the fourth, additional PSC sequence can be selected for use based upon the parameter. At **804**, a primary synchronization code (PSC) can be generated based upon the selected PSC sequence. At **806**, a radio frame that includes the generated PSC can be transmitted over a downlink to indicate the parameter based upon the selected PSC sequence. For instance, an access terminal that receives the radio frame can detect the selected PSC sequence and determine the parameter based thereupon.

In accordance with an example, selection of the PSC sequence can be utilized to differentiate between FS**1** and FS**2**. Following this example, one of the three commonly utilized PSC sequences can be chosen when FS**1** is employed, while the fourth, additional PSC sequence can be selected when FS**2** is utilized (or vice versa). By way of another illustration, selection of the PSC sequence can be used to differentiate between the base station being associated with a unicast system and a multicast system. Thus, one of the three commonly utilized PSC sequences can be selected when a unicast carrier is used, while the fourth, additional PSC sequence can be chosen when a MBSFN carrier is utilized (or vice versa). Moreover, relative locations of the PSC and the SSC, PRS mappings, choice of scrambling code, election of scrambling code set, etc. can be leveraged in conjunction with selection of the PSC sequence to provide notification related to the same parameter (e.g., indicated via PSC sequence selection, . . .) or different parameter(s).

Referring to FIG. **9**, illustrated is a methodology **900** that facilitates deciphering at least one parameter corresponding to a base station in a wireless communication environment. At **902**, a radio frame can be received from a base station. At **904**, the radio frame can be analyzed to determine at least one of relative locations of disparate types of synchronization signals, a sequence utilized to generate a particular type of synchronization signal, or whether the radio frame includes two types of synchronization signals. For instance, relative locations of a PSC with respect to a SSC can be identified. According to another example, a PSC sequence utilized to generate PSCs can be determined. Additionally or alternatively, a PSC can be identified as being included or excluded from the received radio frame. By way of further illustration, a scrambling code utilized by the base station to scramble the SSC can be identified. At **906**, at least one parameter associated with the base station can be recognized based upon the relative locations, the sequence, or whether the radio frame includes two types of synchronization signals. Further, the at least one parameter can be validated based upon an evaluation of a utilized PRS sequence.

It will be appreciated that, in accordance with one or more aspects described herein, inferences can be made regarding efficiently notifying and/or identifying parameter(s) associated with a base station in a wireless communication environment. As used herein, the term to "infer" or "inference" refers generally to the process of reasoning about or inferring states of the system, environment, and/or user from a set of observations as captured via events and/or data. Inference can be employed to identify a specific context or action, or can generate a probability distribution over states, for example. The inference can be probabilistic—that is, the computation of a probability distribution over states of interest based on a consideration of data and events. Inference can also refer to techniques employed for composing higher-level events from a set of events and/or data. Such inference results in the construction of new events or actions from a set of observed events and/or stored event data, whether or not the events are correlated in close temporal proximity, and whether the events and data come from one or several event and data sources.

According to an example, one or more methods presented above can include making inferences pertaining to determining an identity of one or more parameters associated with a base station based upon an evaluation of received synchronization signal(s). By way of further illustration, an inference can be made related to determining a notification scheme employed by a base station for communicating one or more parameter(s) associated therewith via the downlink. It will be appreciated that the foregoing examples are illustrative in nature and are not intended to limit the number of inferences that can be made or the manner in which such inferences are made in conjunction with the various embodiments and/or methods described herein.

FIG. **10** is an illustration of an access terminal **1000** that recognizes parameter(s) associated with a base station utilizing an efficient identification scheme in a wireless communication system. Access terminal **1000** comprises a receiver **1002** that receives a signal from, for instance, a receive antenna (not shown), and performs typical actions thereon (e.g., filters, amplifies, downconverts, etc.) the received signal and digitizes the conditioned signal to obtain samples. Receiver **1002** can be, for example, an MMSE receiver, and can comprise a demodulator **1004** that can demodulate received symbols and provide them to a processor **1006** for channel estimation. Processor **1006** can be a processor dedicated to analyzing information received by receiver **1002** and/or generating information for transmission by a transmitter **1016**, a processor that controls one or more components of access terminal **1000**, and/or a processor that both analyzes information received by receiver **1002**, generates information for transmission by transmitter **1016**, and controls one or more components of access terminal **1000**.

Access terminal **1000** can additionally comprise memory **1008** that is operatively coupled to processor **1006** and that can store data to be transmitted, received data, and any other suitable information related to performing the various actions and functions set forth herein. Memory **1008**, for instance, can store protocols and/or algorithms associated with analyzing synchronization signal(s) included in received radio frames and/or determining parameter(s) based upon such analysis.

It will be appreciated that the data store (e.g., memory **1008**) described herein can be either volatile memory or nonvolatile memory, or can include both volatile and nonvolatile memory. By way of illustration, and not limitation, nonvolatile memory can include read only memory (ROM), programmable ROM (PROM), electrically programmable ROM (EPROM), electrically erasable PROM (EEPROM), or flash memory. Volatile memory can include random access memory (RAM), which acts as external cache memory. By way of illustration and not limitation, RAM is available in many forms such as synchronous RAM (SRAM), dynamic RAM (DRAM), synchronous DRAM (SDRAM), double data rate SDRAM (DDR SDRAM), enhanced SDRAM (ESDRAM), Synchlink DRAM (SLDRAM), and direct Rambus RAM (DRRAM). The memory **1008** of the subject systems and methods is intended to comprise, without being limited to, these and any other suitable types of memory.

Receiver **1002** is further operatively coupled to a synchronization signal evaluator **1010** and/or a parameter identifier **1012**. Synchronization signal evaluator **1010** can be substantially similar to synchronization signal evaluator **410** of FIG. **4**. Moreover, parameter identifier **1012** can be substantially similar to parameter identifier **412** of FIG. **4**. Synchronization signal evaluator **1010** can evaluate synchronization signal(s) included in received radio frames. For example, synchronization signal evaluator **1010** can determine relative locations of differing types of synchronization signals (e.g., relative locations of a PSC versus a SSC, . . .). According to another illustration, synchronization signal evaluator **1010** can recognize a sequence (e.g., PSC sequence, . . .) utilized to generate a particular type of synchronization signal (e.g., PSC, . . .). Pursuant to another illustration, synchronization signal evaluator **1010** can analyze whether the radio frames include one or two types of synchronization signals (e.g., whether the radio frames include or lack PSCs, . . .). Moreover, synchronization signal evaluator **1010** can review a PRS associated with the radio frames. Further, parameter identifier **1012** can leverage the analysis effectuated by synchronization signal evaluator **1010** to determine one or more parameters corresponding to a base station that sent the radio frames over the downlink. Access terminal **1000** still further comprises a modulator **1014** and a transmitter **1016** that transmits the signal to, for instance, a base station, another access terminal, etc. Although depicted as being separate from the processor **1006**, it is to be appreciated that synchronization signal evaluator **1010**, parameter identifier **1012** and/or modulator **1014** can be part of processor **1006** or a number of processors (not shown).

FIG. **11** is an illustration of a system **1100** that utilizes synchronization signals to indicate parameter(s) to access terminals in a wireless communication environment. System **1100** comprises a base station **1102** (e.g., access point, . . .) with a receiver **1110** that receives signal(s) from one or more access terminals **1104** through a plurality of receive antennas **1106**, and a transmitter **1122** that transmits to the one or more access terminals **1104** through a transmit antenna **1108**. Receiver **1110** can receive information from receive antennas **1106** and is operatively associated with a demodulator **1112** that demodulates received information. Demodulated symbols are analyzed by a processor **1114** that can be similar to the processor described above with regard to FIG. **10**, and which is coupled to a memory **1116** that stores data to be transmitted to or received from access terminal(s) **1104** (or a disparate base station (not shown)) and/or any other suitable information related to performing the various actions and functions set forth herein. Processor **1114** is further coupled to a synchronization signal generator **1118** that yields synchronization signals for transmission to access terminal(s) **1104** as a function of parameter(s) associated therewith. For instance, synchronization signal generator **1118** can select PSC sequences based upon a parameter, position a PSC and a SSC in relative locations as a function of a parameter, included or exclude a PSC from a radio frame based upon a parameter, select a PRS based upon a parameter, and so forth. It is contemplated that synchronization signal generator **1118** can be substantially similar to synchronization signal generator **408** of FIG. **4**. Although not shown, it is to be appreciated that synchronization signal generator **1118** can include a selector (e.g., substantially similar to selector **414** of FIG. **4**) and/or a scheduler (e.g., substantially similar to scheduler **416** of FIG. **4**). Further, synchronization signal generator **1118** can provide information to be transmitted (e.g., radio frame, . . .) to a modulator **1120**. Modulator **1120** can multiplex a frame for transmission by a transmitter **1122** through antennas **1108** to access terminal(s) **1104**. Although depicted as being separate from the processor **1114**, it is to be appreciated that synchronization signal generator **1118** and/or modulator **1120** can be part of processor **1114** or a number of processors (not shown).

FIG. **12** shows an example wireless communication system **1200**. The wireless communication system **1200** depicts one base station **1210** and one access terminal **1250** for sake of brevity. However, it is to be appreciated that system **1200** can include more than one base station and/or more than one access terminal, wherein additional base stations and/or access terminals can be substantially similar or different from example base station **1210** and access terminal **1250** described below. In addition, it is to be appreciated that base station **1210** and/or access terminal **1250** can employ the systems (FIGS. **1**, **4**, **10-11**, and **13-14**) and/or methods (FIGS. **7-9**) described herein to facilitate wireless communication there between.

At base station **1210**, traffic data for a number of data streams is provided from a data source **1212** to a transmit (TX) data processor **1214**. According to an example, each data stream can be transmitted over a respective antenna. TX

data processor **1214** formats, codes, and interleaves the traffic data stream based on a particular coding scheme selected for that data stream to provide coded data.

The coded data for each data stream can be multiplexed with pilot data using orthogonal frequency division multiplexing (OFDM) techniques. Additionally or alternatively, the pilot symbols can be frequency division multiplexed (FDM), time division multiplexed (TDM), or code division multiplexed (CDM). The pilot data is typically a known data pattern that is processed in a known manner and can be used at access terminal **1250** to estimate channel response. The multiplexed pilot and coded data for each data stream can be modulated (e.g., symbol mapped) based on a particular modulation scheme (e.g., binary phase-shift keying (BPSK), quadrature phase-shift keying (QPSK), M-phase-shift keying (M-PSK), M-quadrature amplitude modulation (M-QAM), etc.) selected for that data stream to provide modulation symbols. The data rate, coding, and modulation for each data stream can be determined by instructions performed or provided by processor **1230**.

The modulation symbols for the data streams can be provided to a TX MIMO processor **1220**, which can further process the modulation symbols (e.g., for OFDM). TX MIMO processor **1220** then provides N_T modulation symbol streams to N_T transmitters (TMTR) **1222***a* through **1222***t*. In various embodiments, TX MIMO processor **1220** applies beamforming weights to the symbols of the data streams and to the antenna from which the symbol is being transmitted.

Each transmitter **1222** receives and processes a respective symbol stream to provide one or more analog signals, and further conditions (e.g., amplifies, filters, and upconverts) the analog signals to provide a modulated signal suitable for transmission over the MIMO channel. Further, N_T modulated signals from transmitters **1222***a* through **1222***t* are transmitted from N_T antennas **1224***a* through **1224***t*, respectively.

At access terminal **1250**, the transmitted modulated signals are received by N_R antennas **1252***a* through **1252***r* and the received signal from each antenna **1252** is provided to a respective receiver (RCVR) **1254***a* through **1254***r*. Each receiver **1254** conditions (e.g., filters, amplifies, and down-converts) a respective signal, digitizes the conditioned signal to provide samples, and further processes the samples to provide a corresponding "received" symbol stream.

An RX data processor **1260** can receive and process the N_R received symbol streams from N_R receivers **1254** based on a particular receiver processing technique to provide N_T "detected" symbol streams. RX data processor **1260** can demodulate, deinterleave, and decode each detected symbol stream to recover the traffic data for the data stream. The processing by RX data processor **1260** is complementary to that performed by TX MIMO processor **1220** and TX data processor **1214** at base station **1210**.

A processor **1270** can periodically determine which available technology to utilize as discussed above. Further, processor **1270** can formulate a reverse link message comprising a matrix index portion and a rank value portion.

The reverse link message can comprise various types of information regarding the communication link and/or the received data stream. The reverse link message can be processed by a TX data processor **1238**, which also receives traffic data for a number of data streams from a data source **1236**, modulated by a modulator **1280**, conditioned by transmitters **1254***a* through **1254***r*, and transmitted back to base station **1210**.

At base station **1210**, the modulated signals from access terminal **1250** are received by antennas **1224**, conditioned by receivers **1222**, demodulated by a demodulator **1240**, and processed by a RX data processor **1242** to extract the reverse link message transmitted by access terminal **1250**. Further, processor **1230** can process the extracted message to determine which precoding matrix to use for determining the beamforming weights.

Processors **1230** and **1270** can direct (e.g., control, coordinate, manage, etc.) operation at base station **1210** and access terminal **1250**, respectively. Respective processors **1230** and **1270** can be associated with memory **1232** and **1272** that store program codes and data. Processors **1230** and **1270** can also perform computations to derive frequency and impulse response estimates for the uplink and downlink, respectively.

In an aspect, logical channels are classified into Control Channels and Traffic Channels. Logical Control Channels can include a Broadcast Control Channel (BCCH), which is a DL channel for broadcasting system control information. Further, Logical Control Channels can include a Paging Control Channel (PCCH), which is a DL channel that transfers paging information. Moreover, the Logical Control Channels can comprise a Multicast Control Channel (MCCH), which is a Point-to-multipoint DL channel used for transmitting Multimedia Broadcast and Multicast Service (MBMS) scheduling and control information for one or several MTCHs. Generally, after establishing a Radio Resource Control (RRC) connection, this channel is only used by UEs that receive MBMS (e.g., old MCCH+MSCH). Additionally, the Logical Control Channels can include a Dedicated Control Channel (DCCH), which is a Point-to-point bi-directional channel that transmits dedicated control information and can be used by UEs having a RRC connection. In an aspect, the Logical Traffic Channels can comprise a Dedicated Traffic Channel (DTCH), which is a Point-to-point bi-directional channel dedicated to one UE for the transfer of user information. Also, the Logical Traffic Channels can include a Multicast Traffic Channel (MTCH) for Point-to-multipoint DL channel for transmitting traffic data.

In an aspect, Transport Channels are classified into DL and UL. DL Transport Channels comprise a Broadcast Channel (BCH), a Downlink Shared Data Channel (DL-SDCH) and a Paging Channel (PCH). The PCH can support UE power saving (e.g., Discontinuous Reception (DRX) cycle can be indicated by the network to the UE, . . .) by being broadcasted over an entire cell and being mapped to Physical layer (PHY) resources that can be used for other control/traffic channels. The UL Transport Channels can comprise a Random Access Channel (RACH), a Request Channel (REQCH), a Uplink Shared Data Channel (UL-SDCH) and a plurality of PHY channels.

The PHY channels can include a set of DL channels and UL channels. For example, the DL PHY channels can include: Common Pilot Channel (CPICH); Synchronization Channel (SCH); Common Control Channel (CCCH); Shared DL Control Channel (SDCCH); Multicast Control Channel (MCCH); Shared UL Assignment Channel (SUACH); Acknowledgement Channel (ACKCH); DL Physical Shared Data Channel (DL-PSDCH); UL Power Control Channel (UPCCH); Paging Indicator Channel (PICH); and/or Load Indicator Channel (LICH). By way of further illustration, the UL PHY Channels can include: Physical Random Access Channel (PRACH); Channel Quality Indicator Channel (CQICH); Acknowledgement Channel (ACKCH); Antenna Subset Indicator Channel (ASICH); Shared Request Channel (SREQCH); UL Physical Shared Data Channel (UL-PSDCH); and/or Broadband Pilot Channel (BPICH).

It is to be understood that the embodiments described herein can be implemented in hardware, software, firmware, middleware, microcode, or any combination thereof. For a

hardware implementation, the processing units can be implemented within one or more application specific integrated circuits (ASICs), digital signal processors (DSPs), digital signal processing devices (DSPDs), programmable logic devices (PLDs), field programmable gate arrays (FPGAs), processors, controllers, micro-controllers, microprocessors, other electronic units designed to perform the functions described herein, or a combination thereof.

When the embodiments are implemented in software, firmware, middleware or microcode, program code or code segments, they can be stored in a machine-readable medium, such as a storage component. A code segment can represent a procedure, a function, a subprogram, a program, a routine, a subroutine, a module, a software package, a class, or any combination of instructions, data structures, or program statements. A code segment can be coupled to another code segment or a hardware circuit by passing and/or receiving information, data, arguments, parameters, or memory contents. Information, arguments, parameters, data, etc. can be passed, forwarded, or transmitted using any suitable means including memory sharing, message passing, token passing, network transmission, etc.

For a software implementation, the techniques described herein can be implemented with modules (e.g., procedures, functions, and so on) that perform the functions described herein. The software codes can be stored in memory units and executed by processors. The memory unit can be implemented within the processor or external to the processor, in which case it can be communicatively coupled to the processor via various means as is known in the art.

With reference to FIG. **13**, illustrated is a system **1300** that enables efficiently indicating one or more parameters to at least one access terminal in a wireless communication environment. For example, system **1300** can reside at least partially within a base station. It is to be appreciated that system **1300** is represented as including functional blocks, which can be functional blocks that represent functions implemented by a processor, software, or combination thereof (e.g., firmware). System **1300** includes a logical grouping **1302** of electrical components that can act in conjunction. For instance, logical grouping **1302** can include an electrical component for scheduling a primary synchronization code (PSC) and a secondary synchronization code (SSC) at relative locations in a radio frame as a function of a parameter corresponding to a base station **1304**. Moreover, logical grouping can comprise an electrical component for sending the radio frame over a downlink to identify the parameter based upon the relative locations of the PSC and the SSC **1306**. Further, although not shown, logical grouping can also include an electrical component for selecting a PSC sequence based upon a parameter of the base station and an electrical component for generating the PSC based upon the selected PSC sequence. Additionally, system **1300** can include a memory **1308** that retains instructions for executing functions associated with electrical components **1304** and **1306**. While shown as being external to memory **1308**, it is to be understood that one or more of electrical components **1304** and **1306** can exist within memory **1308**.

Turning to FIG. **14**, illustrated is a system **1400** that enables identifying one or more parameters relative to a base station in a wireless communication environment. System **1400** can reside within an access terminal, for instance. As depicted, system **1400** includes functional blocks that can represent functions implemented by a processor, software, or combination thereof (e.g., firmware). System **1400** includes a logical grouping **1402** of electrical components that can act in conjunction. Logical grouping **1402** can include an electrical component for analyzing a radio frame received from a base station to decipher at least one of relative locations of disparate types of synchronization signals, a sequence utilized to generate a particular type of synchronization signal, or whether the radio frame includes two types of synchronization signals **1404**. For instance, the disparate types of synchronization signals can be PSCs and SSCs. Moreover, the sequence can be a PSC sequence. Further, the radio frame can be analyzed to determine whether it includes at least one PSC and at least one SSC or at least one SSC without a PSC. Further, logical grouping **1402** can include an electrical component for recognizing at least one parameter associated with the base station based upon the relative locations, the sequence, or whether the radio frame includes two types of synchronization signals **1406**. Additionally, system **1400** can include a memory **1408** that retains instructions for executing functions associated with electrical components **1404** and **1406**. While shown as being external to memory **1408**, it is to be understood that electrical components **1404** and **1406** can exist within memory **1408**.

What has been described above includes examples of one or more embodiments. It is, of course, not possible to describe every conceivable combination of components or methodologies for purposes of describing the aforementioned embodiments, but one of ordinary skill in the art may recognize that many further combinations and permutations of various embodiments are possible. Accordingly, the described embodiments are intended to embrace all such alterations, modifications and variations that fall within the spirit and scope of the appended claims. Furthermore, to the extent that the term "includes" is used in either the detailed description or the claims, such term is intended to be inclusive in a manner similar to the term "comprising" as "comprising" is interpreted when employed as a transitional word in a claim.

What is claimed is:

1. A method that facilitates identifying communication schemes in a wireless communication system, comprising:

generating a primary synchronization signal and a secondary synchronization signal;

mapping the primary synchronization signal and the secondary synchronization signal at different locations in time of a radio frame, wherein the location of the primary synchronization signal and the location of the secondary synchronization signal relative to each other are determined based at least in part on a first parameter corresponding to a base station, wherein the primary synchronization signal and the secondary synchronization signal are mapped at a periodicity that is independent of the first parameter, the periodicity indicative of how often the primary and secondary synchronization signals are transmitted in the radio frame; and

transmitting the primary synchronization signal and the secondary synchronization signal at the locations in the radio frame over a downlink.

2. The method of claim **1**, wherein the first parameter corresponds to whether the radio frame employs frame structure type **1** (FS**1**) or frame structure type **2** (FS**2**).

3. The method of claim **1**, further comprising:

mapping the primary synchronization signal to a last symbol in one or more slots of the radio frame and the secondary synchronization signal to an adjacent symbol immediately prior to the last symbol when frame structure type **1** is employed by the base station; and

mapping the primary synchronization signal and the secondary synchronization signal to designated symbols in the radio frame, different from the symbols used for the primary synchronization signal and the secondary syn-

chronization signal in frame structure type **1**, when frame structure type **2** is employed by the base station.

4. The method of claim **1**, further comprising:

selecting a primary synchronization code (PSC) sequence based upon a second parameter corresponding to the base station; and

generating the primary synchronization signal based upon the selected PSC sequence.

5. The method of claim **4**, further comprising selecting the PSC sequence from a set of possible PSC sequences based upon the second parameter.

6. The method of claim **5**, wherein the set of possible PSC sequences includes three commonly utilized PSC sequences and a fourth, additional PSC sequence, and wherein two of the three commonly utilized PSC sequences are complex conjugates of each other, and a remaining PSC sequence of the three commonly utilized PSC sequences and the fourth, additional PSC sequence are complex conjugates of each other.

7. The method of claim **6**, further comprising:

selecting one of the three commonly utilized PSC sequences when frame structure type **1** is employed by the base station; and

selecting the fourth, additional PSC sequence when frame structure type **2** is employed by the base station.

8. The method of claim **6**, further comprising:

selecting one of the three commonly utilized PSC sequences when a unicast carrier is employed by the base station; and

selecting the fourth, additional PSC sequence when a multicast carrier is employed by the base station.

9. The method of claim **1**, further comprising mapping different pseudo random sequences (PRSs) to a common cell ID based at least in part on a third parameter corresponding to the base station.

10. The method of claim **1**, further comprising mapping pseudo random sequences (PRSs) to different tone locations based at least in part on a fourth parameter corresponding to the base station.

11. The method of claim **1**, wherein the first parameter includes one or more of whether the base station is part of a time division duplex (TDD) system or a frequency division duplex (FDD) system, whether the base station is associated with a macro cell or a femto cell, or whether the base station is associated with a unicast system or a multicast system.

12. The method of claim **1**, further comprising:

selecting a particular scrambling code from a set of possible scrambling codes based at least in part on a fifth parameter corresponding to the base station; and

generating the secondary synchronization sequence based upon the particular scrambling code.

13. The method of claim **1**, further comprising:

selecting a set of possible scrambling codes based at least in part on a sixth parameter corresponding to the base station;

selecting a particular scrambling code in the set of possible scrambling codes; and

generating the secondary synchronization sequence based upon the particular scrambling code.

14. The method of claim **1**, wherein an amount of separation between the primary synchronization signal and the secondary synchronization signal is based at least in part on the first parameter, and wherein the primary synchronization signal is separated from the secondary synchronization signal by a first amount for a first setting of the first parameter and is separated from the secondary synchronization signal by a second amount for a second setting of the first parameter.

15. The method of claim **1**, wherein the primary synchronization signal and the secondary synchronization signal are transmitted on a designated set of tones.

16. The method of claim **15**, wherein the designated set of tones is a subset of all available tones.

17. The method of claim **1**, further comprising mapping the secondary synchronization signal to a symbol of a slot in one or more slots of the radio frame and mapping the primary synchronization signal to a symbol of a slot subsequent to the slot in which the secondary synchronization signal is mapped when frame structure type **2** is employed by the base station, wherein the primary synchronization signal and the secondary synchronization signal are separated by at least one symbol.

18. A wireless communications apparatus that enables efficiently indicating communication schemes in a wireless communication system, comprising:

means for generating a primary synchronization signal and a secondary synchronization signal;

means for mapping the primary synchronization signal and the secondary synchronization signal at different locations in time of a radio frame, wherein the location of the primary synchronization signal and the location of the secondary synchronization signal relative to each other are determined based at least in part on a first parameter corresponding to a base station, wherein the primary synchronization signal and the secondary synchronization signal are mapped at a periodicity that is independent of the first parameter, the periodicity indicative of how often the primary and secondary synchronization signals are transmitted in the radio frame; and

means for sending the primary synchronization signal and the secondary synchronization signal at the locations in the radio frame over a downlink.

19. The wireless communications apparatus of claim **18**, wherein the first parameter corresponds to whether the radio frame employs frame structure type **1** (FS**1**) or frame structure type **2** (FS**2**).

20. The wireless communications apparatus of claim **18**, further comprising:

means for mapping the primary synchronization signal to a last symbol in one or more slots of the radio frame and the secondary synchronization signal to an adjacent symbol immediately prior to the last symbol when frame structure type **1** is employed by the base station; and

means for mapping the primary synchronization signal and the secondary synchronization signal to designated symbols in the radio frame, different from the symbols used for the primary synchronization signal and the secondary synchronization signal in frame structure type **1**, when frame structure type **2** is employed by the base station.

21. The wireless communications apparatus of claim **18**, further comprising:

means for selecting a primary synchronization code (PSC) sequence based upon a second parameter corresponding to the base station; and

means for generating the primary synchronization signal based upon the selected PSC sequence.

22. The wireless communications apparatus of claim **21**, further comprising means for selecting the PSC sequence from a set of possible PSC sequences based upon the second parameter.

23. The wireless communications apparatus of claim **22**, wherein the set of possible PSC sequences includes three commonly utilized PSC sequences and a fourth, additional PSC sequence, and wherein two of the three commonly uti-

lized PSC sequences are complex conjugates of each other, and a remaining PSC sequence of the three commonly utilized PSC sequences and the fourth, additional PSC sequence are complex conjugates of each other.

24. The wireless communications apparatus of claim **23**, further comprising:

means for selecting one of the three commonly utilized PSC sequences when frame structure type **1** is employed by the base station; and

means for selecting the fourth, additional PSC sequence when frame structure type **2** is employed by the base station.

25. The wireless communications apparatus of claim **23**, further comprising:

means for selecting one of the three commonly utilized PSC sequences when a unicast carrier is employed by the base station; and

means for selecting the fourth, additional PSC sequence when a multicast carrier is employed by the base station.

26. The wireless communications apparatus of claim **18**, further comprising means for mapping different pseudo random sequences (PRSs) to a common cell ID based at least in part on a third parameter corresponding to the base station.

27. The wireless communications apparatus of claim **18**, further comprising means for mapping pseudo random sequences (PRSs) to different tone locations based at least in part on a fourth parameter corresponding to the base station.

28. The wireless communications apparatus of claim **18**, wherein the first parameter includes one or more of whether the base station is part of a time division duplex (TDD) system or a frequency division duplex (FDD) system, whether the base station is associated with a macro cell or a femto cell, or whether the base station is associated with a unicast system or a multicast system.

29. The wireless communications apparatus of claim **18**, further comprising:

means for selecting a particular scrambling code from a set of possible scrambling codes based at least in part on a fifth parameter corresponding to the base station; and

means for generating the secondary synchronization sequence based upon the particular scrambling code.

30. The wireless communications apparatus of claim **18**, further comprising:

means for selecting a set of possible scrambling codes based at least in part on a sixth parameter corresponding to the base station;

means for selecting a particular scrambling code in the set of possible scrambling codes; and

means for generating the secondary synchronization sequence based upon the particular scrambling code.

31. The apparatus of claim **18**, wherein an amount of separation between the primary synchronization signal and the secondary synchronization signal is a function of the first parameter, and wherein the primary synchronization signal is separated from the secondary synchronization signal by a first amount for a first setting of the first parameter and is separated from the secondary synchronization signal by a second amount for a second setting of the first parameter.

32. The apparatus of claim **18**, wherein the primary synchronization signal and the secondary synchronization signal are transmitted on a designated set of tones.

33. The apparatus of claim **32**, wherein the designated set of tones is a subset of all available tones.

34. In a wireless communications system, an apparatus comprising:

a memory; and

a processor coupled to the memory and configured to:

generate a primary synchronization signal and a secondary synchronization signal;

map the primary synchronization signal and the secondary synchronization signal at different locations in time of a radio frame, wherein the location of the primary synchronization signal and the location of the secondary synchronization signal relative to each other are determined based at least in part on a first parameter corresponding to a base station, wherein the primary synchronization signal and the secondary synchronization signal are mapped at a periodicity that is independent of the first parameter, the periodicity indicative of how often the primary and secondary synchronization signals are transmitted in the radio frame; and

send the primary synchronization signal and the secondary synchronization signal at the locations in the radio frame over a downlink.

35. The apparatus of claim **34**, wherein the first parameter corresponds to whether the radio frame employs frame structure type **1** (FS**1**) or frame structure type **2** (FS**2**).

36. The apparatus of claim **34**, wherein the processor is configured to:

map the primary synchronization signal to a last symbol in one or more slots of the radio frame and the secondary synchronization signal to an adjacent symbol immediately prior to the last symbol when frame structure type **1** is employed by the base station; and

map the primary synchronization signal and the secondary synchronization signal to designated symbols in the radio frame, different from the symbols used for the primary synchronization signal and the secondary synchronization signal in frame structure type **1**, when frame structure type **2** is employed by the base station.

37. The apparatus of claim **34**, wherein the processor is configured to:

select a primary synchronization code (PSC) sequence based upon a second parameter corresponding to the base station; and

generate the primary synchronization signal based upon the selected PSC sequence.

38. The apparatus of claim **37**, wherein the processor is configured to:

select the PSC sequence from a set of possible PSC sequences based upon the second parameter.

39. The apparatus of claim **38**, wherein the set of possible PSC sequences includes three commonly utilized PSC sequences and a fourth, additional PSC sequence, and wherein two of the three commonly utilized PSC sequences are complex conjugates of each other, and a remaining PSC sequence of the three commonly utilized PSC sequences and the fourth, additional PSC sequence are complex conjugates of each other.

40. The apparatus of claim **39**, wherein the processor is configured to:

select one of the three commonly utilized PSC sequences when frame structure type **1** is employed by the base station; and

select the fourth, additional PSC sequence when frame structure type **2** is employed by the base station.

41. The apparatus of claim **39**, wherein the processor is configured to:

select one of the three commonly utilized PSC sequences when a unicast carrier is employed by the base station; and

select the fourth, additional PSC sequence when a multicast carrier is employed by the base station.

42. The apparatus of claim 34, wherein the processor is configured to:

map different pseudo random sequences (PRSs) to a common cell ID based at least in part on a third parameter corresponding to the base station.

43. The apparatus of claim 34, wherein the processor is configured to:

map pseudo random sequences (PRSs) to different tone locations based at least in part on a fourth parameter corresponding to the base station.

44. The apparatus of claim 34, wherein the first parameter includes one or more of whether the base station is part of a time division duplex (TDD) system or a frequency division duplex (FDD) system, whether the base station is associated with a macro cell or a femto cell, or whether the base station is associated with a unicast system or a multicast system.

45. The apparatus of claim 34, wherein the processor is configured to:

select a particular scrambling code from a set of possible scrambling codes based at least in part on a fifth parameter corresponding to the base station; and

generate the secondary synchronization sequence based upon the particular scrambling code.

46. The apparatus of claim 34, wherein the processor is configured to:

select a set of possible scrambling codes based at least in part on a sixth parameter corresponding to the base station;

select a particular scrambling code in the set of possible scrambling codes; and

generate the secondary synchronization sequence based upon the particular scrambling code.

47. The apparatus of claim 34, wherein an amount of separation between the primary synchronization signal and the secondary synchronization signal is based at least in part on the first parameter, and wherein the primary synchronization signal is separated from the secondary synchronization signal by a first amount for a first setting of the first parameter and is separated from the secondary synchronization signal by a second amount for a second setting of the first parameter.

48. The apparatus of claim 34, wherein the primary synchronization signal and the secondary synchronization signal are transmitted on a designated set of tones.

49. The apparatus of claim 48, wherein the designated set of tones is a subset of all available tones.

50. A computer program product, comprising:

a non-transitory computer-readable medium comprising:

code for causing at least one computer to generate a primary synchronization signal and a secondary synchronization signal;

code for causing the at least one computer to map the primary synchronization signal and the secondary synchronization signal at different locations in time of a radio frame, wherein the location of the primary synchronization signal and the location of the secondary synchronization signal relative to each other are determined based at least in part on a first parameter corresponding to a base station, wherein the primary synchronization signal and the secondary synchronization signal are mapped at a periodicity that is independent of the first parameter, the periodicity indicative of how often the primary and secondary synchronization signals are transmitted in the radio frame; and

code for causing the at least one computer to send the primary synchronization signal and the secondary synchronization signal at the locations in the radio frame over a downlink.

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